The Monthly Review

Published by the AMERICAN ELECTROPLATERS' SOCIETY

JANUARY 1939

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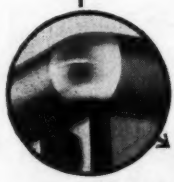

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The Monthly Review

Published by the AMERICAN ELECTROPLATERS' SOCIETY, Inc.

A Society for the Advancement of the Science of Electroplating

JANUARY 1939

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A Message from your President

It is the custom at the end of one year and at the beginning of another to take inventory and lay plans to make the new year brighter and happier.

First you take inventory. We are a big society and getting bigger. At the close of our fiscal year we had over 1600 members, and, since then, through your efforts we have shown a very substantial increase.

Much has been accomplished in the plating field. Information of great value has been distributed, and, what is much more important, it has been used. Your Society has the advantage that everyone is interested in the same line of endeavor and is in a position to put things into practice. It is an educational society, which applies its education to service.

It is impossible to list as an inventory all of the useful information which is being used to make plating better and less costly, and it is equally impossible to set a value on good will, but both items are big ones and have become agreeably larger in the past year.

Our greatest asset is the spirit of friendship and co-operation among our members.

Now have a look at our new year. Here is a book with most of the pages blank as yet, but the potentialities are very great. First among our opportunities is the improvement of our greatest asset, which, as stated above, is friendly co-operation. This

we should miss no opportunity to increase. There are very few of us who receive any direct remuneration from the Society. It is, therefore, a fair assumption that each member is trying to do the best he can for the Society and what he can get out of it. We all want to get a lot out of A.E.S.; and the best way we can do this is to put a lot into it. The meetings of our branches are being more and more helpful. The papers and discussions are the best indication of what is being accomplished. Let us all make a New Year's Resolution to attend our branch meetings, and take our problems with us; and don't forget to take with you some idea which will help the other fellow.

The Research Committee is well on its way to produce some more fundamental knowledge which we can all use. This Committee has a big job. The men in it are making a sincere and effective effort; but it also requires your loyal support. The Chairman of this Committee has ably outlined in the December REVIEW what is being done and what is contemplated. This work has been approved by the Society in general, after a lot of deep consideration, and its successful completion will help you and help the industry.

We are all looking forward to our meeting in Newark. It is one of the big opportunities of the Society and the plating fraternity all over the world. Let us all continue to contribute to make this the best Convention ever held.

I think you will all agree with me that the REVIEW has improved and is improving all the time. Its pages are full of things we can read with profit. Be sure to keep our editor supplied with the things that have helped you. Also, see that your friends keep their products advertised in our REVIEW.

Let me close by hoping for you that you will all do much in 1939 to achieve what you most desire and that this achievement will bring with it the greatest happiness.

W. M. PHILLIPS,
President,
American Electroplaters' Society.

Current Distribution in Electrodeposition

I. Linear, Cylindrical and Spherical Conductors[1]

BY CHARLES KASPER[2]

(Read at the Milwaukee Convention, 1938, by Wm. Blum)

First of a Series of Articles by Dr. Kasper on Current Distribution

I. INTRODUCTION

ONE of the principal problems in electroplating practice is to effect the deposition of metal as uniformly as possible over the significant surface of the object that is plated. The required degree of uniformity is governed by what is practicable from a commercial standpoint with the objects that are dealt with and the solutions at the disposal of the platers.

The efforts of electrochemists to devise solutions that will give a more uniform current distribution have resulted in numerous publications on throwing power in the past twenty-five years. Because it is difficult to analyze the effect of each variable that enters, these investigations have been concerned largely with devices for the measurement of throwing power. It is not the purpose of the present article to survey critically this aspect of electrodeposition, but two pertinent points may be noted. (1) The effects of positive throwing power can not be large, in an absolute sense, compared with the variations in the primary current distribution, and are therefore, secondary in importance. (2) When, however, (as in chromium plating), a solution has a negative throwing power, the effect may be serious from the standpoint of practical plating.

In short, after commercial considerations have determined the objects that are to be plated and the solutions to be used, the task of the electroplater is to apply the deposit with the required uniformity. This can be done only through a rather comprehensive knowledge of current distribution, which may be obtained either through experience or through theoretical investigations.

1 Publication approved by the Director of the National Bureau of Standards of the U.S. Department of Commerce.

2 Chemist, National Bureau of Standards.

Although the electroplater is in a position to observe the practical effect of current distribution on the objects which he plates, it is undoubtedly advantageous, in addition, to study the problem from a theoretical angle. The problem of current distribution represents an important step in theoretical electricity, which has been the task of able minds for more than a century. Although these studies are of importance to many branches of exact science, they are particularly adapted to the consideration of the problem of current distribution.

This is the first of a series of papers to make some of this material available to electroplaters. The shapes that are convenient to consider mathematically are not necessarily those that enter into practical electroplating, but through them some positive notions of current distribution can be acquired. In this first paper we shall consider the three systems in which it is possible to get absolutely uniform current distribution; namely parallel planes, concentric cylinders, and concentric spheres.

In later papers consideration will be given to objects that do not have a uniform current distribution, and to the following subjects: angles, curvature of surfaces, "stop-off", walls, shields and "thieves"; the effect of polarization on current distribution and the conditions under which it is important; and, lastly, the devices for the measurement of current distribution.

The articles are primarily written for the electroplaters, but for those who wish to consider the subject from the standpoint of mathematics, this will be considered in appendices.

II. THE PROBLEM OF CURRENT FLOW

Electrical conductors may be divided into two classes, known as linear conductors and non-linear conductors. A linear conductor may be illustrated by a wire or rod of uniform cross-section, in which the drop of potential is proportional to the distance. In non-linear conductors this is not true. Practically all plating tanks represent non-linear conductors. The consideration of linear conductors is simple, while that of non-linear conductors is rather difficult.

The problem of current flow is treated from the standpoint of the theory of the potential. The word potential, which in electricity is a synonym for voltage, refers to potential energy, which is stored-up energy that may become active when per-

mitted to do so. For example, the motor-generator supplies potential energy, and when this is applied to the terminals of a tank it dissipates itself. In any circuit the difference in potential divided by the current which flows is called resistance. What is required is to go a step further and inquire into the question of the current distribution. This can be done with an astonishing degree of success from a consideration of the shape and position of the objects and the tank. Quantitative considerations demand the use of either mathematics or experiments, but qualitative ideas can be readily obtained. The ideas must be followed through by sketches in order to comprehend the situation clearly, as emphasized by James Clark Maxwell, one of the greatest students of electricity[3].

Before considering the principal ideas of current distribution, a simplification of the problem must be made. First, the popular idea that the flow of current through the electrodes influences current distribution is incorrect. This effect exists, but it is too small to be of practical significance, because the conductivity of metals is much higher than that of the electrolytes used. Second, as mentioned, polarization is a secondary effect, as are also stratification, variations in temperature, and convection. Hence, we will deal with the primary determining factor of the current distribution, the geometry of the system. Consideration of the secondary factors will be made in due course.

The fundamental ideas are the following: The entire surface of the anodes is at one potential and the entire surface of the cathodes is at another, since the main drop of potential occurs in the solution. They are called equipotential surfaces. (2) The next important idea is that the flow of electricity is normal (perpendicular) to any equipotential surface. This means that over any equipotential surface the flow of electricity is directly away from or toward it. The reason is that the force, either push or pull depending upon the way it is looked upon, is exactly the same all over the surface. (3) The flow of current through the tank is studied through the conception of imaginary equipotential surfaces. Suppose we have a difference of ten volts between the anode and the cathode. If the latter is assumed to be at

3 "It appears that what we want is a knowledge of the forms of equipotential surfaces and lines of induction (current-flow) in as many cases as we can collect together and remember. In certain classes of cases, such as those relating to spheres, we may proceed by mathematical methods. *In other cases we cannot afford to neglect the humbler method of drawing tentative figures on paper and selecting that which appears least unlike the figure we require.*

zero potential its surface constitutes one equipotential surface. In the solution we may plot an imaginary equipotential surface whose potential is everywhere one volt different from that of the cathode. This may be repeated for intervals of two, three, or four, etc., up to nine, volts. If we continue in steps of one volt, at ten volts we will have the anode forming the equipotential surface. The important point is that in going from the cathode to the anode, the shape and position of the equipotential surfaces have changed from those of the cathode to those of the anode. The size and shape of the tank also enter into the form and position of these equipotential surfaces, the separation of which determines the current distribution. By this means another important point has been solved, that is, the actual path by which the electricity may be said to flow. The current leaves the anode normally, intersects every equipotential surface normally and finally hits the cathode normally. These lines of flow, called current lines or stream lines, are straight lines only under unusual circumstances.

There are two other points that are implied in the above discussion, but which will be emphasized because of their importance. (4) Equipotential surfaces never cross each other and are either closed or end at the tank walls. (5) In consequence of (4), current lines can never cross each other.

III. THE LINEAR CONDUCTOR

As was previously mentioned, a wire is an example of a linear conductor. It will be profitable, however, to arrive at the conception of a linear conductor from another point of view, in order to make clear what conditions must be satisfied before an electrolytic conductor can be called a linear conductor. Suppose the anode and cathode are two very large plates that are parallel to each other. (Only the inside region will be considered now, and the end effects will be taken into consideration in a later paper). Since the two plates, which are equipotential surfaces, are parallel, the lines of current flow, which are normal to the plates, are all in the same direction, that is, the flow of current will be directly across in parallel lines. The imaginary equipotential surfaces form a system of planes parallel to the electrode plates. The current density on every section of each plate is exactly the same, and this will also be true for the parallel imaginary

planes. Hence, they will be spaced uniformly and the drop of potential will be the same per unit distance.

The practical consideration of the infinitely large plates is out of the question, so systems must be devised which are equivalent. If a section is cut out so that it does not interfere with the current flow inside of it, the section will still constitute a linear conductor. This is done by making the walls of the conductor at right angles to the equipotential surfaces, or in other words, by making the walls parallel with the lines of flow. For example, a box like that in Fig. 1 is a linear conductor. For such a con-

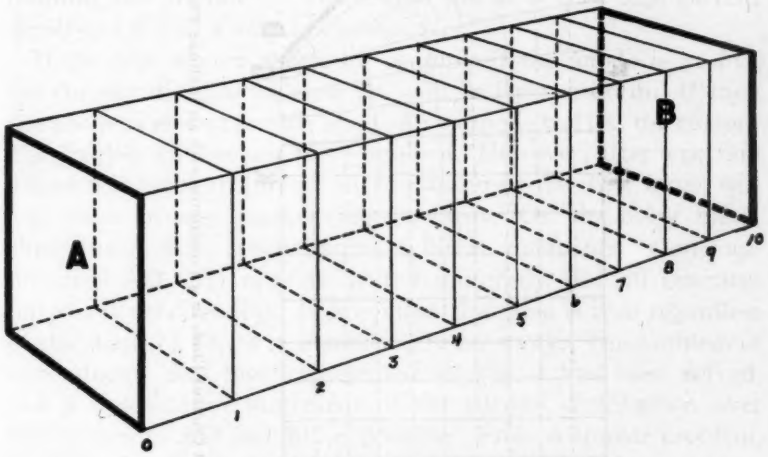


Fig. 1. Sectioning to Form a Linear Conductor

ductor it is essential that the electrodes be exactly the same, plane and parallel, and the walls at right angles to them. The general form for resistance is

$$R \text{ (resistance)} = \frac{\text{drop of potential}}{\text{current}} = \frac{V_1 - V_2}{I}$$

In a linear conductor

$$R = \frac{V_1 - V_2}{I} = \frac{l}{aK}$$

where

l is the length
a is the cross section
K is the specific conductivity of the medium

As an example of non-linear conductor, suppose that, instead of as in Fig. 1, one electrode is inclined as in Fig. 2. AB is one

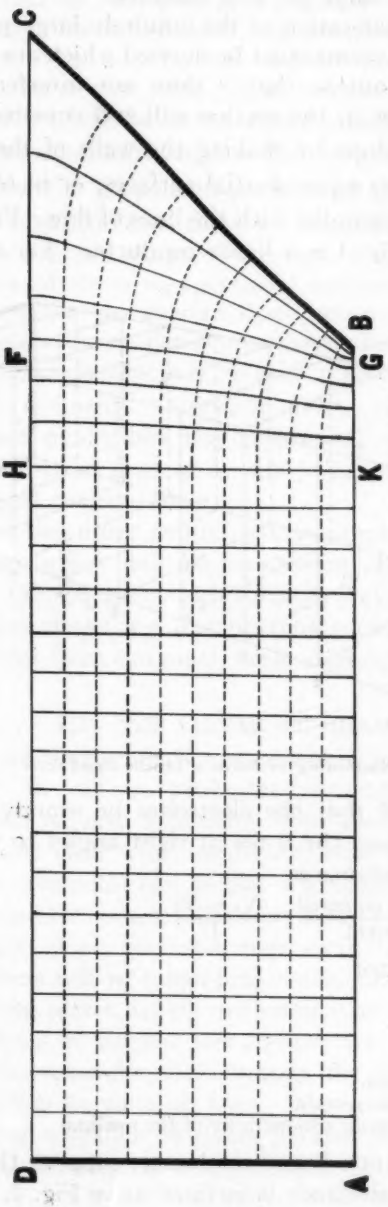


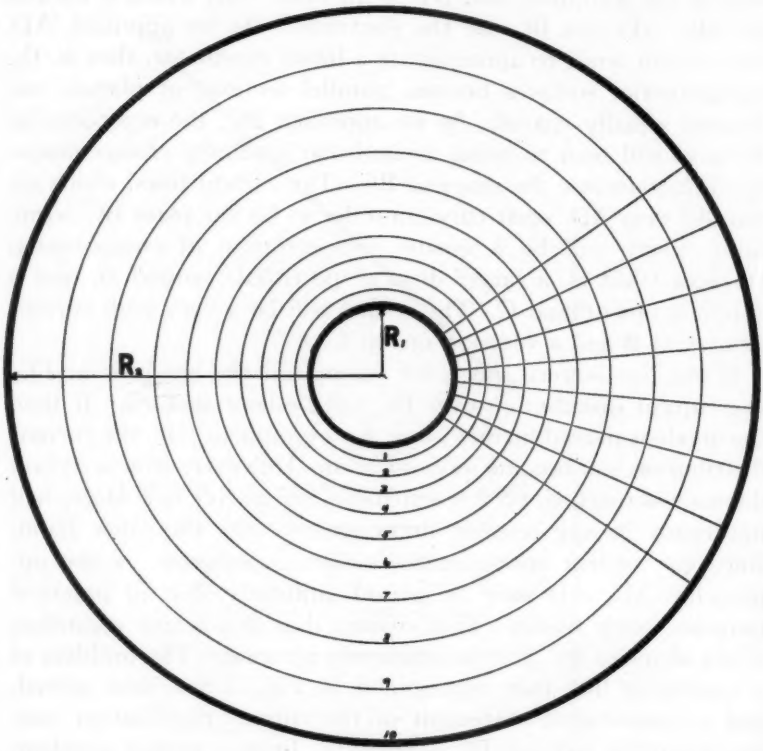
Fig. 2. Equipotentials and Current Lines in a Conductor with an Inclined Plate Electrode

side of the container, and DC is the other side, which is parallel to AB. AD and BC are the electrodes. As we approach AD, the system tends to approximate a linear conductor, that is, the equipotential surfaces become parallel sections of planes, and become equally spaced. As we approach BC, the equipotential surfaces will tend to swing around and gradually change shape, until they assume the shape of BC. The current lines, which are parallel near AD, must curve in order to hit the place BC normally. There will be a greater concentration of equipotential surfaces (that is, a larger drop of potential) around B, and a thinning out around C. The results will be a very high current density at B and a very low one at C.

If the box is very short, for example if the anode is at FG, the current distribution over BC will be least uniform. If then the anode is moved further away, for example to HK, the current distribution will become more uniform. However, after a certain distance is reached, further extension, no matter how large, will not result in any sensible improvement. On the other hand, since the system approximates a linear conductor as one approaches AD, AD may be plated uniformly (for all practical purposes) very readily. It is evident that this is true regardless of the shape of BC, if it is sufficiently far away. The problem of a conductor like that represented in Fig. 2 has been solved, and a quantitative statement of the current distribution over the electrodes AD and BC is possible. From a similar problem, in which it is assumed that the length of the box is very long, we shall show in a later article the current distribution around sharp corners and angles. In fact, the problem can be extended to give the current distribution over a corrugated surface. The logical steps which will be considered are no more difficult than those already taken.

IV. THE CYLINDRICAL CONDUCTOR

In this system, illustrated in Fig. 3, two concentric cylinders constitute the electrodes. In order to avoid the complication of the open ends, the cylinders will be made very long and only the region away from the ends will be considered. The radius of the inside cylinder is R_1, and that of the external cylinder is R_2. The distance between the two cylinders is everywhere the same. The imaginary equipotential surfaces will be a series of cylinders



CYLINDERS

Fig. 3. Equipotentials and Current Lines Between Concentric Cylindrical Electrodes

between the two electrodes, with which they are coaxial. It has already been established that the lines of current flow must be normal to the cylinder, that is, they will proceed directly away from the internal cylinder, and directly into the external one or vice versa, depending upon which is made the anode. These current lines may, therefore be considered to be drawn from the center.

The problem which next arises is the separation of the equipotential surfaces. It can be seen that the drop per unit distance

will be greater as we proceed from the outer toward the internal cylinder. Since the same current flows to each cylinder, the current density is greater on the smaller electrode, and upon the cylinders near it that represent the equipotential surfaces. This greater current density must correspond to a greater drop in potential. The equipotential surfaces, drawn to scale in Fig. 3, are not therefore equally spaced. Actually their separations vary as the logarithms of their distances from the center.

The formula for the resistance per unit length of the cylinder is

$$\text{Resistance} = \frac{V_1 - V_2}{I} = \frac{2.303}{2\pi K} \log. 10 \frac{R_2}{R_1}$$

where I is the total current and K is the specific conductivity.

An interesting deduction can be made from this formula. The resistance (per unit length) of a system of two concentric

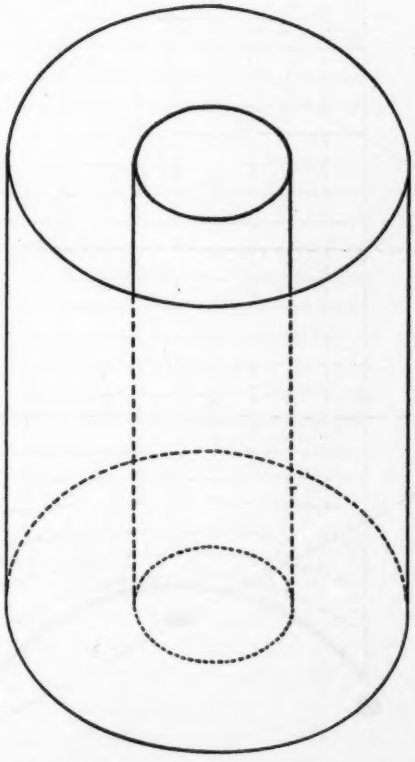


Fig. 4. Sectioning to Form Equivalent Cylindrical Conductor

cylindrical electrodes with a conducting medium between them is independent of their absolute size (which may be inches or miles) and merely depends on the ratio of the radii.

The sectioning out of equivalent systems will now be considered. If a section is cut so that the containing walls (one of which may be the top of the solution) are perpendicular to the axis of the cylinder (Fig. 4) a simple cylindrical conductor results.

The radial sectioning of a system, shown in Fig. 5, also produces an equivalent system.

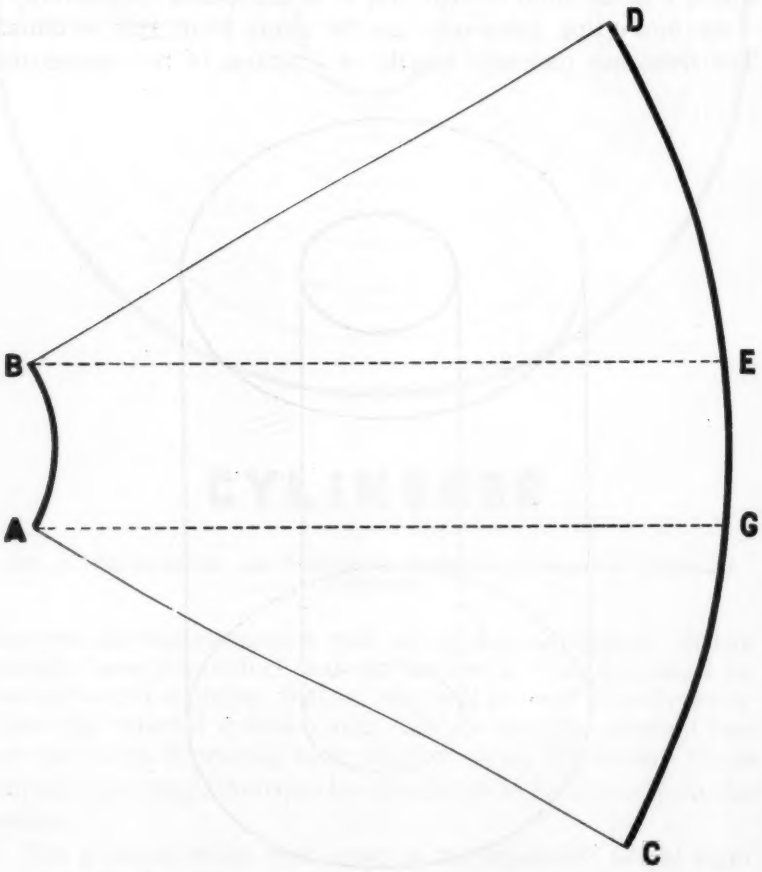


Fig. 5. Sectioning to Form Equivalent System to That of a Cylindrical Conductor

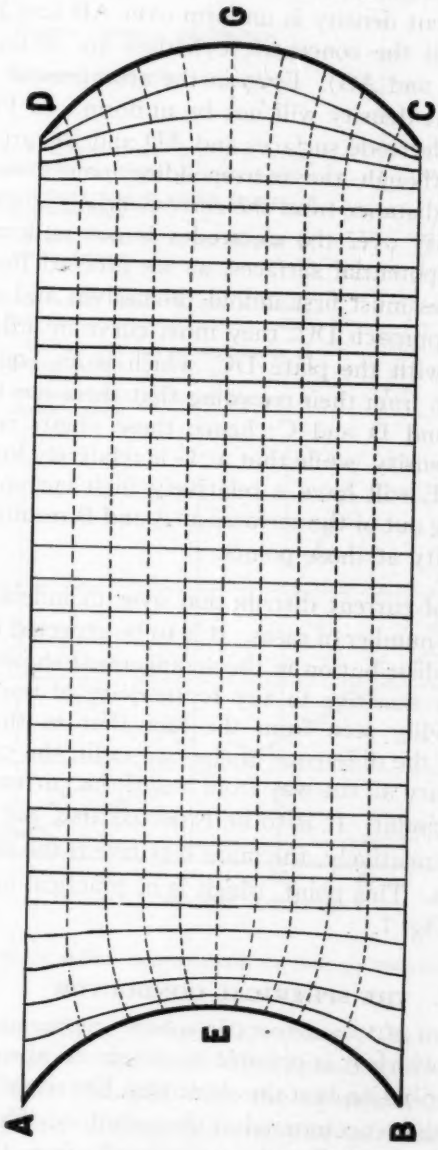


Fig. 6. Example of a Conductor That is Non-Cylindrical

In Fig. 5, AB is one electrode and CD is the other. BD and AC are walls of the container. This is the only such arrangement in which the current density is uniform over AB and DC. This will not be true if the concentric cylinders are sectioned with parallel lines (BE and AG). Even in the arrangement shown in Fig. 6, the current density will not be uniform. In Fig. 6, AB and CD are the electrode surfaces and AD and BC are the sides of the tank. Although the corresponding points on AB are exactly the same distance from the corresponding points on DC, the current density over the electrodes is not uniform. If we consider the equipotential surfaces, as we proceed from AB to DC, these surfaces must first unfold themselves and straighten out, and as we approach DC, they must curve in order to ultimately coincide with the plate DC, which is an equipotential surface. It is seen from their crowding that there is a large drop of potential around D and C; hence these points receive the highest current density, while that at G is relatively low. At the other electrode, E will have a relatively high current density, while the thinning out of the surfaces at A and B results in a very low current density at those points.

The problem of current distribution over cylinders has been studied in a large number of cases. It is to be expected intuitively that the current distribution in the arrangement shown in Fig. 5 will be extremely sensitive to any eccentricity of the cylinders. This can be readily seen from the fact that in the distance corresponding to the difference of the two radii, the current distribution must vary all the way from a uniform current distribution to a short circuit. It is to be expected that the larger the internal cylinder relatively, the more sensitive is the centering of the two cylinders. This point, which is of practical importance, is illustrated in Fig. 7.

V. THE SPHERICAL CONDUCTOR

An arrangement of two concentric spheres represents the third and last case in which it is possible to obtain an absolutely uniform current distribution over the electrodes. The situation is somewhat similar to that encountered in the cylinders. The stream or current lines will be radial, and pass normally from the internal to the external sphere. The equipotential surfaces between the

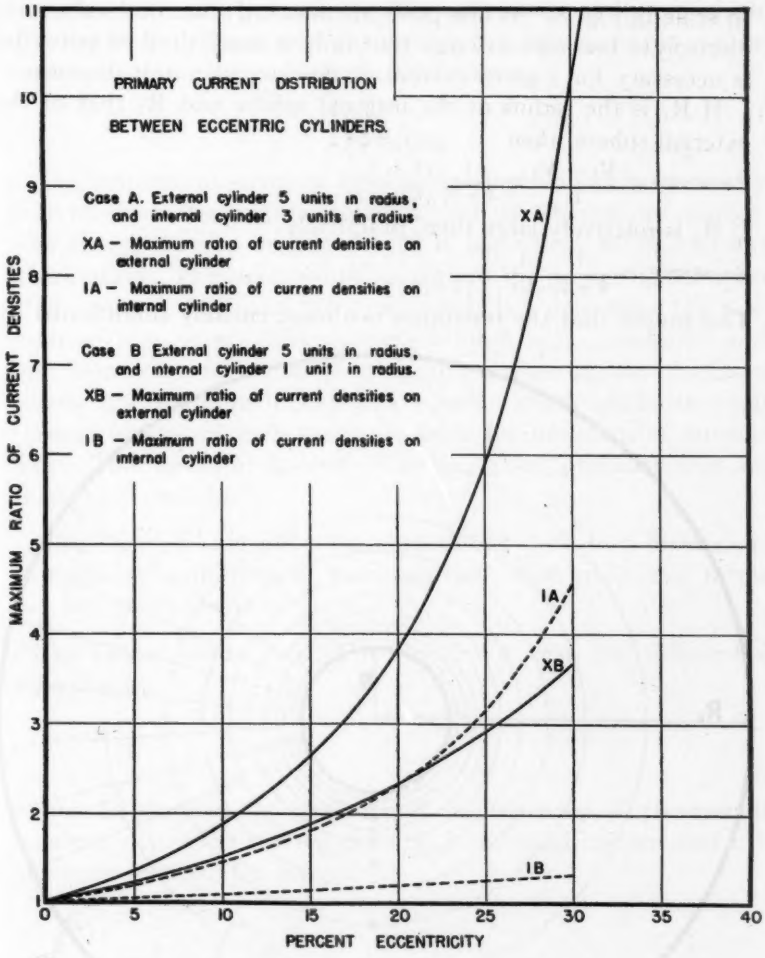


Fig. 7. Effect of Non-Concentricity on Current Distribution of Cylinders

two spheres will be concentric spheres. Their spacing will become closer as we approach the internal sphere, much closer in fact than that obtained with the cylinders, because the total area of a sphere varies as the square of its radius. Hence most of the drop in potential will occur in the immediate neighborhood of the internal sphere. These equipotential surfaces are drawn

to scale in Fig. 8. As one proceeds outward, the total volume of electrolyte becomes so large that only a small drop of potential is necessary for a given current to flow across a unit distance.

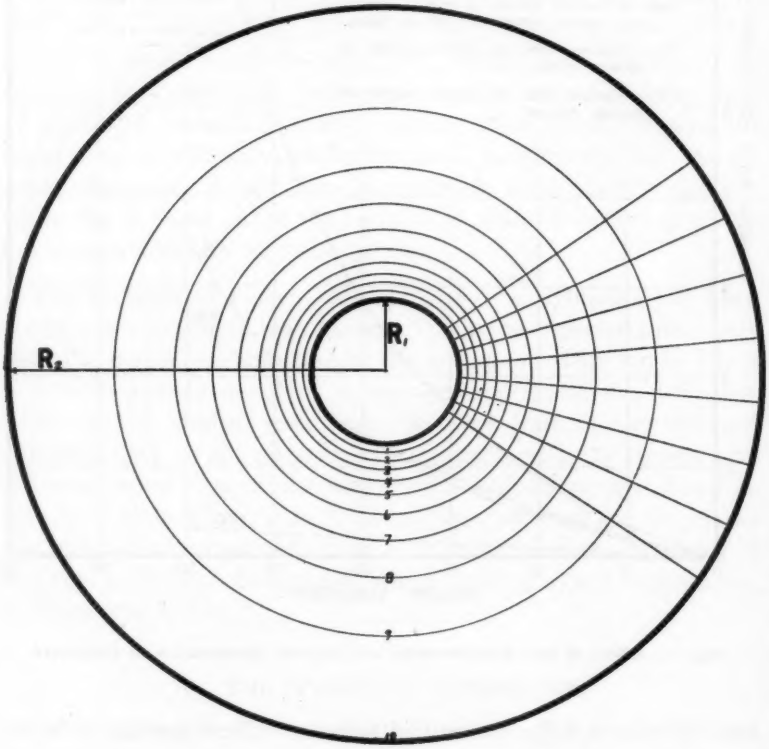
If R_1 is the radius of the internal sphere and R_2 that of the external sphere, then

$$\text{Resistance} = \frac{V_1 - V_2}{I} = \frac{1}{4\pi K}\left(\frac{1 - 1}{R_1 \quad R_2}\right).$$

If R_2 is relatively large then, practically,

$$\text{Resistance} = \frac{1}{4\pi K} \cdot \frac{1}{R_1}.$$

This means that the resistance is almost entirely conditioned by



SPHERES

Fig. 8. Equipotentials and Stream Lines Between Concentric Spherical Electrodes

the size of the internal sphere. The magnitude of R_2 for which this is true for all practical purposes is not very great, as can be readily established by placing in trial values.

APPENDIX

The material on primary current distribution can be generally derived from electrostatic cases (where the charges are equal). The charge density on the objects is equivalent to the current distribution. The electrostatic case gives the proper distribution of the electric field, and the gradients which determine the flow from point to point. When a space is filled with a conductor and provision is made for keeping up the charge on the objects a steady flow is obtained. This idea, which is important in electrical theory, makes all such cases available for problems of current flow. This material is treated in any good graduate text on theoretical electricity.

The forms which have been presented were first derived as capacitance equations in electrostatics. The resistance forms can be readily derived.

(a) Linear conductors. For the linear case the differential equation is

$$i = -K\frac{\delta V}{\delta X} = \frac{I}{a}$$

Where $\frac{\delta V}{\delta X}$ denotes the gradient of the potential, K the specific conductivity, i the current density, I the total current and a is the cross section. On integrating

$$\int_{V_1}^{V_2} \delta V = \frac{-I}{Ka} \int_{x_1}^{k_2} \delta x$$

$$V_2 - V_1 = \frac{-I}{Ka}(x_2 - x_1)$$

or

$$R = \frac{V_1 - V_2}{I} = \frac{x_2 - x_1}{Ka} = \frac{1}{Ka}$$

(b) Cylindrical conductors. The current density over an

equipotential surface of a cylinder must be equal to the total current divided by the perimeter. Hence we obtain

$$i = -K \frac{\delta V}{\delta i} = \frac{I}{2\ r}.$$

On integrating

$$\int_{V_1}^{V_2} \delta V = -\frac{I}{2\pi K} \int_{R_1}^{R_2} \frac{\delta r}{r}$$

$$V_2 - V_1 = \frac{-I}{2\pi K} \log E \frac{R_2}{R_1}$$

or

$$R = \frac{V_1 - V_2}{I} = \frac{1}{2\pi K} \log E \frac{R_2}{R_1} = \frac{2.303}{2\pi K} \log 10 \frac{R_2}{R_1}$$

It is assumed in this problem that the length of the cylinder is unity in the dimensions given by K. Of course the length can be readily introduced, merely by dividing the last expression by l_1, the length.

(c) Spherical conductors. The current density must be equal to the total current divided by the area of the equipotential surface of a sphere; that is by $4\pi r^2$, where r is the radius of the sphere. We then have

$$i = -K \frac{\delta V}{\delta r} = \frac{I}{4\pi r^2}$$

And, on integrating, we have

$$\int_{V_1}^{V_2} \delta V = \frac{-I}{4\pi K} \int_{R_1}^{R_2} \frac{\delta r}{r^2}$$

$$V_2 - V_1 = \frac{I}{4\pi K} \left(\frac{1}{R_2} - \frac{1}{R_1} \right)$$

or

$$R = \frac{V_1 - V_2}{I} = \frac{1}{4\pi K} \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

Generators *and* Their Troubles

By L. L. SOFFEL
Treasurer of Ohio Carbon Company, Cleveland, Ohio
Read at January Meeting of Detroit Branch

BRUSHES on commutating equipment have three distinct functions to perform. First, they must carry the load current to and from the armature; second, they must resist destructive action from the voltage induced in imperfectly compensated armature coils undergoing commutation; third, they must act as a bearing material, preferably without applied lubrication. It is difficult to obtain, in one material, the ideal properties for each of these functions. It is therefore necessary to find that combination of properties which will give best performance in all respects. Obviously, the combination that is satisfactory under one set of conditions may prove less satisfactory when conditions are changed. This is especially true of plating generators, since, for efficient operation they must be located adjacent to or in the plating room itself, and the average plating room is far from ideal as a health resort for any electrical equipment, when we consider the corrcsive solutions and fumes which are usually present in abundance.

I cannot resist the temptation to illustrate by telling you of an incident that occurred a few years ago. The owner of a job plating shop called me in because his generator had developed the jitters. This machine had been on location about ten or fifteen years with apparent satisfactory operation but in recent months the brushes were being consumed at a more rapid rate than in the past. A quick examination revealed the fact that the brushes were made by the company that pays my salary so by this time I became very much interested in the case. The brushes were sparking quite badly and dusting considerably as the result. When informed that this make and grade of brush had given satisfaction over a period of years it was apparent that the trouble was elsewhere in the machine. Adjustment of brush position got us nowhere. The machine was heating which indicated a possible overloaded condition but no ammeter existed by which to indicate this. The owner then remarked that his

power bill was becoming increasingly larger as the months rolled by although he insisted that the amount of work turned out was not in proportion.

This generator was mounted on the wood floor at the end of a plating tank. Presently the operator started to unload his tank and with each sweep of a rod full of gadgets coming out of the plating bath, the generator would be christened with plating solution. This was the clue. The windings of the generator and the wood floor were so saturated with plating solution that a drop in voltage could be taken from one girder to another in the structure of the building. Not only was the generator grounded but it was also called upon to plate the iron beams in the building. The generator just could not take it, that's all! A complete overhaul of the machine and good scrubbing of the surrounding landscape and all was well.

If a motor or generator is systematically inspected and properly maintained, serious troubles seldom occur; because they are dealt with before they get "grown up". When, however, in spite of care brush troubles do develop, the following points may help to determine their cause or causes quickly before they can spread and become more complicated—which is much better than grabbing up some tools and starting to "do something" without any clear idea of what you are looking for.

Let us therefore arrange the symptoms and their causes logically. The principal troubles of brushes are sparking, heating and rapid wear. Sparking is primarily due to electrical unbalance in the even flow of current in the machine; consequently it is just as likely—in fact even more so—to be caused by some defect quite apart from the brushes as anything else. Thus sparking may be an exceedingly useful thing at times, for it gives indication of hidden troubles which might otherwise be overlooked till they led to a breakdown. Heating is basically a symptom of either excessive mechanical friction or of electrical overloading. Fortunately, it generally appears at the point where the trouble exists. Excessive wear is primarily due to too much mechanical friction, electrical overloading or to unsuitable brush material.

Having these primary symptoms in mind, we next decide what conditions can produce them; remembering that since one defect tends when neglected to produce others, the longer the matter is left alone the worse job we shall have in sorting out the over-

lapping symptoms and diagnosing the basic cause or causes. We then proceed to check up the facts, and by a process of elimination we arrive at what must be done. To use Sherlock Holmes' famous dictum, "When you have eliminated the impossible, the remainder—however improbable—must be the truth".

SPARKING

Any of the following may cause sparking as a primary symptom.

(1) Dirt. This may cost the brushes, and the metal on which they run, with a poorly-conducting film which must be pierced by the current every time the machine is started. (Oil, corrosive fumes, etc., may also be called "dirt".) Arcing takes place under the brush and ultimately destroys the intimate contact between it and the metal surface. The resulting unbalance due to the constant interruptions of current will ultimately cause pitting and burning of the ring or commutator, then still worse sparking, heating and brush-wear if neglected. Dirt may also cause the brushes to stick in their holders, thus intensifying the already-existing mess.

(2) Bad bedding of the brush on its running face; because the current rating of a brush is always based on its entire face area being in proper contact. It if is not, the current-density on the remaining area will be too high. Heating as well as sparking will be thus likely to occur. This is true of a motor or a generator whether it is equipped with commutator or slip-rings; but in the former type the matter may be still further complicated by the inadequate area failing to bridge the right number of bars and not being able to correctly neutralize the momentary short-circuit currents in the armature coils as these pass successively under the brushes. A loose brush stud will of course cause bad brush bedding, since the brushes will be allowed to tilt upwards by the force of the springs. Worn holder-boxes which permit the brushes in them to "wobble around"; brushes too small to fit the holders; and putting a new brush into a worn holder; will produce bad sparking also, particularly if the machine happens to be of a design which does not employ pigtails to assist in carrying the current between brush and holder.

(3) Wrong brush pressure. If too light, proper contact will not be obtained; if too heavy, there will be heating due to friction.

Furthermore, excessive spring pressure affects disproportionately that quality in a brush which is known as its "contact drop"—the resistance due purely to the contact surfaces and not to the material of the brush itself. Since this characteristic is depended on very largely to kill the above mentioned short-circuit currents, the commutation will be upset more or less seriously.

(4) Wrong brush position. This may be due to the rocker being in a wrong position as a whole, or to one or more of the brush studs being out of alignment. Correcting the rocker position will cure the first trouble; but will not cure the second, for although it may stop sparking on some of the brushes it will start sparking on others which did not spark before.

(5) Bad commutator or ring surface. Strictly speaking, this is generally a result rather than a cause of sparking. It may, however, be either according to circumstances. It is a case of "Which came first, the hen or the egg?".

(6) Mechanical shocks or vibration, causing jumping of the brushes.

HEATING

This is seldom found alone, though sparking often is. Heating, sparking and rapid wear are apt to be associated in varying proportions, especially if the maintenance of the machine has been neglected. However, the principal causes in which heating is a prominent feature are as follows:

(1) Machine overloaded. All brushes heat equally. Sparking and wear generally present, though not always. The obvious thing to do is to reduce the load if at all possible—if not, to substitute brushes of higher carrying capacity.

(2) Anything which interferes with the equal distribution of the total current among the various brushes. Bad bedding; loose or misaligned brush studs, (causing the commutation to try to take place at the wrong point of the brush, or maybe outside it altogether); excessive differences of brush pressure, causing the contact drop to be so lowered on some of them that most of the current travels through these to the almost complete exclusion of the others; mixing two or more grades of brushes on a machine at once, (resulting in those having the lower resistance to hog most of the load); and brushes of too low a current-carrying capacity being fitted either partly or throughout; all these will cause heating on those brushes which are overloaded. Loose

brush connector cables or broken pigtails on certain brushes can cause similar unequal current distribution.

(3) Excessive spring pressure which may not be sufficient to upset the current-balance. The heat is then entirely due to friction.

(4) Defects elsewhere on the machine. These will also practically always cause sparking as well. Short-circuited or broken fields, or broken or short-circuited armature coils, will produce excessively unequal division of current, and since they thus produce electrical unbalance in the resultant field they cause sparking also—usually fairly violent. A short-circuited field coil is always colder than the others; a short-circuited armature coil is always hotter.

EXCESSIVE BRUSH WEAR

This is almost always a result following upon either excessive sparking, excessive heating, heavy spring pressure, rough commutator, or rarely undue softness of the brush material for its job. Generally the cause of such softness is oil-soaking. Some bearings seem to throw out oil even when new; but in most cases oil-throwing is traceable either to worn bearings or to over-enthusiastic oiling. Oil can, and should, be promptly removed from cables and windings before it can damage them. But when a brush is oily there is nothing you can do about it except replace it with a new one. Wiping the oil off does not remove what has soaked into the interior, and washing in solvent merely helps the oil to penetrate the brush material easier and further than it could otherwise do. Occasionally, of course, the wrong grade of brush may be ordered by mistake, and it may be insufficiently hard to withstand normal operating conditions.

In the practical application of the analytical—or if you prefer it, the "sleuthing" system of trouble-shooting—one of the awkward features is that there is generally too much evidence, (most of it pointing in the wrong direction). It is thus often hard to recognize the basic causes.

Instances might be multiplied almost indefinitely. Some problems are tougher than others and may take the most skillful engineer some time to solve; but there are mighty few troubles which do not yield to a systematic analysis.

Now I would like to make a few remarks especially about the operation and care of plating generators, and the causes of most troubles.

(1) When you install the machine locate it so as to affect a complete protection from plating solutions and corrosive fumes, yet make it accessible. A machine that is hard to get at is hard to clean and maintenance men like all human beings take life's easiest course.

(2) Be sure that the foundation for the machine is substantial. You can stop a lot of vibration hence reduce brush trouble and much brush wear if your generator is well bolted down to a good foundation.

(3) If your generator is belt driven be sure the belt is smooth running. If direct connected to motor drive be sure the coupling is lined up properly. Faults in either type of drive cause undue vibration resulting in poor commutation, hence high brush and commutator wear.

(4) Never apply oil or grease to any type brush. All you do is to build up a high resistance film on the commutator and brush faces, and eventually ruin your brushes not to mention the possibility of doing considerable damage to the commutator.

(5) Because a plating generator is by necessity a low voltage machine it requires a brush of high metal content to effect efficient operation. Contact drop is that voltage which is lost in the contact between the brushes and the commutator. It would be out of the question to use a carbon brush because of a high contact loss between the brushes and the commutator. Furthermore a carbon brush would lack sufficient current carrying capacity. Therefore brushes of high metallic content must be used. These types of brushes have certain limitations. Whereas the brush manufacturer does incorporate a lubricant, usually graphite, into a metallic type brush making the material akin to an oilless bearing, the brush must function as a commutative medium as well. Excessive sparking at the brushes rapidly burns out the metallic particles in the faces of the brushes causing rapid disintegration of the brush material. When this happens the brush faces lose their polish and if allowed to continue the result will be disastrous to both brushes and commutator. There is a cause for the trouble. Find it and correct it. Neglect it and you soon will have a nice repair bill not to mention a new set of brushes. While a brush manufacturer naturally likes to sell his wares, remember that about 90% of the brush failures originate in improper care of machines.

FACTORS TO BE CONSIDERED IN CLEANING BEFORE BRIGHT NICKEL PLATING

Paper Read Before Grand Rapids Branch By E. S. Bradley
Written By Mr. E. C. Rinker of the Oakite Products Company

Previous to the introduction of bright nickel plating and chromium plating, the electroplater was primarily concerned with the removal of oils, grease films and solid matter before electrodeposition of a metal. Any peeling or blistering was laid to the incomplete removal of these films. Along with this problem was of course the removal of oxides or tarnish films that were present before entering the plating bath.

The examination of work being cleaned consisted of looking for a "water break" or any visible film of oxide or tarnish present on the work.

With the introduction of bright-nickel and chromium plating processes, many new problems presented themselves to the platers.

1. Difference in surface finish requirements on metals to be plated.
2. Inherent properties of the bright nickel and chromium.
3. Contamination of various solutions in the plating cycle with chromic acid.

Let us consider these problems briefly:

1. Previously, the finish of the basis metal was not always given a highly buffed surface because after the plating operation the electrodeposit was buffed to secure the desired highly buffed finish. We are all aware of the fact that surfaces that are rough from castings, grinding, sandblasting or etching provide for more adherent deposits. This is due to increased area of the surface and mechanical interlocking of the electroplate. It has been reported by various investigators that polishing and buffing may be the cause of poor adhesion because of lowering the ductility of the surface and greater susceptibility to hydrogen enbrittlement. This surface, however, must be preserved because of the nature of the subsequent bright nickel deposit.

2. The high current densities at which bright nickel deposits are made are often the cause of brittle, burned and peeling deposits. This is due to the variation of current density on various parts of an article being plated.

The co-deposition of basic compounds in these areas tend to make the deposits hard and brittle. These sections often peel despite the perfect preparation in cleaning the basis metal. Ways of overcoming this problem are solved by careful design of the racks, increasing the distances between the anodes and cathodes, lowering of current density or placing "bumpers" alongside of the work which tends to steal the excessive current densities on exposed portions of the work.

Quite often a plater will examine a bright-nickel deposit and find it perfect in appearance but when chromium plated, peeling occurs. This is caused by the buckling stresses of the nickel deposit being further increased by the chromium deposit to the extent where the force was greater than the adherence of the deposit, or where the adherence is better fine vein-like cracks can be seen with the naked eye.

3. Contamination of chromium in the various alkaline solutions and the nickel solution has often been the cause of rejects through peeling, graying of deposits or in extreme cases no deposition at all.

Several investigators have studied the effect of chromic acid in nickel solutions and found that small amounts have a deleterious effect on the nickel deposits and increasing amounts effect the cathode efficiency. As little as 1/15 oz./gal. of chromic acid in some nickel solution will cause the formation of film and prevent deposition.

Investigations of chromic acid contamination of alkaline electrocleaners have been carried out in our laboratories to study the effect of the contamination when the cleaned work was nickel plated. As little as 1 oz. Chromic acid in 1800 gallons of an alkaline electrocleaner will prevent adhesion of nickel on brass.

Exhaustive tests were made on steel and other metals with almost identical results. Lack of time prevents a more detailed discussion on the above subject.

When articles are made of cold rolled steel stampings and bright nickel plated, special consideration must be given to cleaning operations. The method of cleaning has a great bearing on the quality and appearance of the electrodeposit.

There are numerous methods of cleaning these metals among which are the use of the solvent degreaser, the use of emulsifying solvents and alkaline cleaners.

If the steel is not polished, the materials generally found on the steel are stamping oils, lubricating or anti-rust oils which usually have dirt and dust particles held on the metal by these grease films. Carbon smut is also present and must be removed to get perfect results. Most of the oils and greases are of a mineral type which are not saponifiable, others contain a mixture of mineral oils and vegetable oils. Whenever the saponifiable oils are mixed with the mineral oils, the cleaning problem is somewhat simplified. Sulphur base mineral oils, which are used for high speed cutting, drilling and tapping present a difficult problem and simple alkaline cleaning compounds are inadequate to remove many of these oils.

Emulsifying solvents have proven to be of immense value in pre-cleaning operations on work of this kind. These solvents have the property of penetrating the oily film and when subjected to a water spray rinse, emulsify and consequently remove not only the heavy oil but also all the dust, dirt and carbon smut.

The advantages of this process are:

1. Elimination of hand wiping or tumbling operations.
2. Elimination of irregularities in the electroplate where wiping or tumbling has been impractical.
3. Brighter finish of electroplated deposits.
4. Better coverage in plating recessed areas.
5. Increased speed of cleaning.
6. Improved corrosion resistance of electroplate surfaces.

When cold rolled steel articles are heavily copper plated they are quite often buffed to secure a brilliant finish. The copper deposit is generally done in a Rochelle salt copper cyanide solution. The highly finished deposits can be easily damaged or destroyed by subsequent cleaning operations.

Buffing compounds usually contain, as binding agents oleostearine and stearic acid which form soap in alkaline solutions. Soaps made from these compounds are not readily soluble. As we know intricate shaped articles have the tendency to collect these buffing compounds, which when they harden are difficult to remove. The often required prolonged soaking, swabbing, etc., will tend to tarnish to such an extent that it may dull the finish which will ultimately affect the bright nickel plate.

Careful buffing to eliminate this condition has been proven time and again to be the most economical in the long run. When this condition is eliminated, a soaking operation can be eliminated. Electrocleaning for 1 minute direct and few seconds reverse current in a suitable electrocleaner followed by a cyanide and acid dip and rinsing operations provide a surface which can be bright nickel plated and chromium plated without a dull or streaky appearance.

Quite often finger stains are encountered on buffed copper and brass and many efforts are made to remove same by brushing, swabbing and soaking. There is no method of removing a finger stain completely without effecting the buffed surface. This stain is caused by the acid perspiration from the fingers, and actually attacks and penetrates the metal to such an extent as to cause a slight etch which will be quite noticeable on a highly buffed article after bright nickel and chromium plating. The only method of getting rid of these stains is to handle with cotton gloves so as not to have the direct contact with the hands. This practice is almost a ritual in manufacturing concerns in the east, particularly in the hardware and novelty trade.

Cleaning Polished Steel

When polished steel articles are to be bright nickel plated, certain conditions

are encountered. Among these conditions are peeling, streaky and dull patches and roughness, etc. These conditions are quite often caused by the cleaning operations.

To analyze these conditions and the effect produced in the bright nickel bath we must consider the material we have to remove from the polished steel. The polishing sticks or lubricating stick is generally made of mutton tallow or beef tallow sometimes mixed with a little petrolatum or paraffin. This compound is usually saponifiable. After the polishing operation, the materials to be removed are these tallows, along with finely divided emery particles, metal and carbon smut. Analysis of this dirt shows as high as 90 to 95% solid matter, the rest the binding agent. When solvent degreasers are used, they quite often remove this material, but when any of the solid matter remains in a finely divided state, no amount of alkaline electrocleaning will completely rid the polished surface of this smut consequently dull streaky particles are noticeable in the bright nickel. Where the condition is exaggerated, these particles will cause a sandpaper effect which is directly traceable to the metallic particles of the abrasive or metal particles. This condition should not be confused with sandiness or roughness caused by impurities or solid matter separated in a bright nickel solution, which adheres to the work while plating, causing almost identical result.

When polished work is given a cleaning operation in a washing machine using an alkaline material, a soap is formed by saponification of the mutton or beef tallow when in contact with the alkaline solution. The film thus formed under certain conditions, is an insoluble soap film which forms a layer on the surface of the metal or over gobs of polishing dirt which prevents penetration to some extent thus not completely saponifying the polishing compounds. The insoluble film tends to hold the solid matter. When this condition is present mechanical scrubbing or swabbing by hand after soaking in an alkaline cleaner is the one method of removing this insoluble film.

Any portion of the surface that is not completely brushed will become quite visible after bright nickel plating. This unswabbed portion will be slightly gray and streaky.

Another cause of defective deposit is caused by too great a contamination of the electrocleaner with soap built up by saponification of great quantities of polishing material. The polished steel may appear to be perfectly free of any grease or soap film after the rinsing operation. The practical method is by looking for a "water break" on the surface.

However, when the steel is immersed in an acid dip, this soap film which did not show a "water break" is converted back to a fatty acid and on subsequent rinsing will quite often show a water break. Sometimes this break on the polished surface may be a delayed water break and the plater will place the work into the nickel bath. The result in these instances will be a slightly stained condition similar in appearance to a water stain. This faint cloudy appearance cannot be buffed out of the nickel plate without cutting through the electrodeposit.

The presence of these extremely thin soap or fatty acid films cause poor adhesion of the nickel to the base metal and when chromium plated more often than not peeling occurs. When a "water break" is noticeable a quick immersion in an alkaline cleaning solution is often sufficient to remove the fatty acid film by resaponifying the fatty acid from the acid dip.

Cleaning of Brass and Soft Soldered Work

In preparing buffed brass and soft soldered work, certain conditions confront the electroplater that require deviation from normal procedure.

Brass alloys containing high percentages of zinc are attacked in solutions of high alkalinity. Copper and bronze alloys are also subject to tarnish in these solutions so emphasis should be placed on having the buffed work enter the plating department in such a condition as to require a minimum of cleaning and soaking.

Copper, tin and zinc introduced into an alkaline electrocleaner through

various means will deposit on prolonged cleaning when used as a cathode. Therefore, the shortest length of time possible to eliminate a water break the better. Anodic cleaning is not advisable due to extreme attack on these alloys. On prolonged cleaning, these metals will deposit on the work in a loosely adherent smut condition which will cause poor adherence of the bright nickel and chromium.

Selection of the cleaning materials for brass and bronze alloys is an important item to consider.

Wherever soft soldered work is encountered a condition occurs where the alkaline material attacks and partially dissolves the solder. Since the greater portion of the solder is tin, this metal dissolves and is immediately redeposited in close proximity of the soldered portion.

When a bright nickel deposit is made over this solder directly, the deposit will peel in the surrounding area of the soldered portion. To overcome this condition some platers give the work a cyanide copper flash plate. This invariably covers the soft solder but after the bright nickel deposit, gray or dark streaks near the soldered parts are noticeable. Peeling occurs quite often despite the copper deposit. A good practice is to go through the electrocleaning and acid dipping operations and then immerse in a sodium cyanide solution (6 oz./gal.). Use reverse current for a second or so. Caution should be used as prolonged time with reverse current will ruin the surface for plating. After reverse current the work is transferred directly to a copper cyanide solution and given a one minute or more copper strike.

By doing this dark deposits and peeling will be eliminated almost entirely.

In preparing an article on "Cleaning Before Br ght Nickel Plating" it would be misleading to elaborate on different types of alkaline cleaners without covering the above mentioned subjects.

Having briefly described certain conditions that cause trouble in a bright nickel plating process, no set rules can be laid down as to the proper method of cleaning or the choice of a cleaning compound. Each cleaning process must be planned to meet the individual condition.

There are many plants using electrocleaners of a rosin type with a great deal of success. It might be pointed out that in using cleaners of this kind great care should be taken in dissolving the cleaning compounds and when additions are made, they should not be carelessly dumped in. Quite often the lack of success is due to incomplete saponification of the rosin which adheres to the polished surface and causes trouble. Correct placing of the heating coils is particularly important when using a cleaner of this nature. Where buffing and polishing compounds are heavily impregnated on the work, a soak tank containing a rosin is preferred as they have not only good wetting, emulsifying and saponifying qualities but do not effect polished surfaces of brass and copper readily.

When a precleaning tank or soak tank is used, the preferred electrocleaning solution is one that has not only good saponifying and emulsifying properties but one that is free from inhibitors. Free rinsing properties are of course essential.

Where a variety of work composed of all types of metals and alloys are electrocleaned, a good practice is to use 2 separate electrocleaning tanks. The first tank using direct current and the second using reverse current.

Any metallic or smut deposit formed in the direct cleaning will be removed by the reverse current in the second tank.

Caution should be used when cleaning with reverse current as the cleaner will attack non-ferrous metals and racks should be touched to the work rod only momentarily.

There are a number of plants using still cleaners with good success, but in these cases the work has been carefully prepared before entering the alkaline bath.

While there is no doubt that improper cleaning is often the cause of rejects plating foremen have come to realize that other factors do contribute to rejected work.

FREE! FREE! FREE!

INFORMATION OF THE

"INTERNATIONAL CONVENTION"

NEWARK BRANCH A. E. S.

AT ASBURY PARK, N. J.

June 19th, 20th, 21st, 22nd

1939

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MANUFACTURERS: — Choice Exhibit Space Is Rapidly Being Reserved by Progressive Concerns.

PLATERS: — Indications From All Sources Show That This Convention is to be Largely Attended.

CHEMISTS: — Papers for Presentation are Being Prepared by Leading Men in the Field.

TO ALL INTERESTED: — Educational Exhibits, Displays, Presentations Pertaining to the Art, are in Preparation.

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Pre-Convention News Reaches Foreign Countries

Write

NEWARK BRANCH, A. E. S. HOTEL DOUGLAS, NEWARK, N. J.

NOTES ON ANNUAL EDUCATIONAL SESSIONS

These affairs have come to be the culmination of local effort, expended throughout the year, to achieve the utmost in demonstrating the aims of the American Electroplaters' Society both as regards ability to secure interesting speakers for the educational session; to provide sociability for the members and their friends and to attract as many as possible of the out-of-towners from other branches or in sales organizations from far and near.

It has been exceedingly gratifying to follow the development of plans discussed at the Milwaukee Convention in June, 1938, along the lines there suggested, to avoid overtaxing the suppliers by excessive advertising or other costs; execution thereof demonstrating justification of the ability of platers and their associates to maintain a high standard of educational and social contacts with an equable distribution of the burden among all interested parties.

From conversations with those attending various affairs throughout the country and from personal observations of same, it is apparent that an interchange of information among the branches would be beneficial toward creating a universally acceptable formula (with variations to suit local conditions) leading toward a more successful conduct of these affairs.

In the first place, the lists of speakers sent each educational chairman or branch secretary this year, are generally agreed to include some of the best prepared individuals to bring to the attention of platers the latest thought and most advanced ideas in methods, processes and equipment procurable. Of course there were many other firms and individuals requested to appear on this list equally well equipped to carry out the same program, who for one reason or another either failed to reply or were unable to appear this season but quite probably would be available for special occasions upon local request and it is hoped these persons will be subject to appearance where requested next year. Or, should anyone have been overlooked, in arranging the schedule, it was not by design, but through lack of knowledge of his willingness to appear before the various branches and it would be considered a favor if such persons would write or otherwise make known their feelings.

Moreover, the large percentage of those whose expenses are guaranteed before the branches this year makes for an easier budget with no expense attached to the branch, in which respect it should be mentioned, however, that in every case someone should be delegated to meet these persons immediately upon their arrival and not to leave them until their departure; at the same time making them feel free from any surveillance during their stay but unobtrusively caring for their comfort and convenience as only a local man can do for a visitor to a strange city. Personally, this has been the procedure with any branches visited by the writer and the courtesies extended are deeply appreciated and never to be forgotten.

As to banquets following educational sessions, a less definite procedure has been the case but should now be developed along better lines. To begin with, out-of-town visitors frequently have their wives in attendance and a ladies' committee should be appointed to meet and care for these visiting ladies from the moment of their arrival until their husbands are free from the meeting rooms. This includes hiring of a room with proper mirrors and other facilities in the same hotel in which the annual affair is held, preferably on the same floor if possible; and several plans laid for varying tastes as, museum trips; theatre attendance; cards or games for those so inclined or shopping tours. The important thing is to see the visiting lady has no embarrassing moments waiting in a hall, lobby or foyer before she is taken in charge by the local ladies' committee, and in order to facilitate these suggestions, sufficient ladies should be willing to serve as to work in relays, also greeting and caring for those arriving for the banquet only; wherefore the personalized room instead of the public powder rooms heighten the remembrance of that particular branch in their visitors' minds.

There should also be a neatly lettered sign in a conspicuous place showing the room numbers of sales representatives registered in the hotel, provided that upon request they are willing to so have their location advertised. This is merely a courtesy to such individuals as well as providing simple directions for those wishing to consult them.

Now regarding the seating arrangements at the banquet. This has long been a contentious point but by someone's hard work and evidence to please may become a pleasurable memory for all attending.

This individual should be one well acquainted with the local and expected arrivals from out-of-town and his work should be facilitated by announcements during the meeting and by signs that all tables are reserved and that those first applying for table reservations will be given their choice of tables from the plans available at his desk.

As early as possible, this person takes his place at a conspicuously located desk or table with a plan of dining arrangement previously laid out tentatively with the maitre de hotel.

Each table is numbered on the plan and so arranged that upon request any number of tables may be grouped together to accommodate parties requesting such seating.

For each table, he has a previously prepared pad as below:

Table No. 1
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

and as rapidly as reservations are requested and made, he fills in both the name and the ticket number in the spaces provided. If some individual has nine in his party and another twelve, the table reservation cards then contain the numbers of the tickets surrendered for that particular table and may be closed out and dispatched to the maitre de hotel as rapidly as filled, giving that individual an opportunity to increase his waiter and kitchen forces in accordance with the growth of seatings.

As each ticket is lifted from the person surrendering it, if a cash payment, it is so noted on the back of the ticket and the money collected. If not a cash payment, there is no embarrassment, since the number was originally noted when mailed or otherwise distributed and it may be billed following the banquet.

Each individual surrendering a ticket receives a stub with his table number upon it, which he in turn surrenders to the waiter when requested and it is from these stubs the final settlement with the management of the hotel is conducted.

Now what does all this do?

1. Assures each guest of a definite seat and table associates acceptable to him. (Some extra tables are always held open for single arrivals or those

known to the individual operating the scheme to be better seated separately. These may be double, quadruple or full seating as desired, although it is advisable to have some of all kinds open.)

2. If properly advertised before meal time, reservations will have been made sufficiently in advance so that all the required tables may have been set up in adequate time and the entrance march will find all diners going into an orderly room knowing exactly where they are to be seated and avoiding all rushing for places; of which there is nothing funnier than a perfect gentleman and lady avidly desiring a particular table and making all haste thereto endeavoring at the same time to appear nonchalant and just out for a constitutional stroll before eating; shoving, pushing and tripping to the contrary notwithstanding.

3. Your guests are made to feel as such and not as though, by perhaps unavoidable tardiness, they are pariahs obliged to stand dumbly aside while special preparation is made for them. (Always have at least two extra tables unreserved for late arrivals and direct them thereto by the same reservation procedure. The management will assist.)

Now as regards favors and such. It all depends on what kind of an affair is desired. If you want a noisy, bang-up good time spread yourselves on balloons, rattles, etc., and keep the orchestra going loud and strong with a stentorian master of ceremonies to whoop it up when things start to die down between courses; but should it be deemed advisable to have some of the more prominent individuals or officers speak between courses, omit the noise makers and substitute some favors either purchased or donated by firms who are pleased to do so if properly approached.

From the budget side it were better to have no purchased favors at all and no orchestra until after the meal, hiring perhaps an accordionist or other good individual entertainer instead, who will carry things along very well and make the intervals for guest speakers at the proper times.

Door prizes are a very good inducement for affairs of this kind and can readily be secured from suppliers in place of expensive advertisements in a program no one examines anyhow.

These should be drawn by duplicate checks distributed with the table reservations and done in such a manner that proportional representation is assured, i.e., if a table for six is allotted one prize, a table for twelve should have two, while a table of forty should receive at least six prizes; then in finality several prizes should be distributed on a general drawing, these to be the more valuable ones and to go wherever luck may call.

A little forethought in this matter will please every table. All prizes should be run off and speeches finished during the change of courses so that at the dessert, if a show is contemplated it should immediately follow before people leave the tables. Darkening of the lights in the dining section centers interest on the stage or section of floor reserved for the show and discourages moving around by the diners until its conclusion.

Following the show a prompt clearance of the floor for dancing will please the younger attendants who have been anxiously awaiting this period.

An affair of this kind may be produced for a price not to exceed the food cost per ticket of twenty-five to fifty cents, depending on expected attendance, while the lower the price, comparable with good quality food and service, the greater the attendance, which latter is in the final analysis most desired.

Of course it is generally understood that many branches have raised the funds for their delegates expenses and in fact enough to carry them for the whole year from this one affair and a non-profit type does not take care of these items; but there must be some better means to secure these essential funds than by bracing our best friends, the suppliers, for them and it is hoped these pages will shortly contain an improved method for painlessly securing them as worked out by some of our more successful branches.

FREDERICK FULFORTH.

THE ADVENT OF THE NEW YEAR

should be cause for reflection by every member of the American Electroplaters' Society to the important accomplishments made by our society in the past and the opportunities of greater things for the future.

Due to our increase in membership, our MONTHLY REVIEW has grown to be a splendid magazine filled with interesting and helpful data pertaining to our Art. Our Research Committee is doing a splendid job solving plating troubles, and a free copy of the proceedings of this committee was placed in the hands of every member of the A.E.S.

As Chairman of the Membership Committee, I believe that these and other accomplishments should be brought to the attention of potential members. It certainly pays large dividends to belong to the A.E.S., and the goal of 800 new members set by our President for this year should be entirely possible.

What is a big job for a few can be made easy if we all help. Let every member assist in this drive, and I'm sure our Asbury Park Convention will see our objective reached.

R. M. GOODSELL,
Chairman of Membership Committee

NOTICE

The Electroplating Division, E. I. du Pont de Nemours & Company, announces new prices effective immediately on Silver Cyanide, as follows:

Quantity	*Price per Ounce*
1000 ozs. minimum	39 1/8 cents
500 to 999 ounces	39 3/8 cents
80 to 499 ounces	39 5/8 cents
16 to 79 ounces	42 1/4 cents

Prices on Silver Cyanide are quoted subject to change with fluctuations in the market price of silver bullion.

NEW ENGLAND BRANCHES TO HOLD EDUCATIONAL SESSION AND BANQUET

The following Branches have decided to participate in a Joint Educational Session and Banquet, to be held in the Spring at a time and place to be decided upon when the representatives of the different Branches get together for their first meeting.

Hartford, represented by Joseph Pietro, president, Vernon Grant, secretary.

Bridgeport, represented by Dr. Walter Meyer, Managing Editor of *Metal Industry* and Ray O'Connor.

New Haven, represented by Joseph Downes, Pres., Joseph Sullivan, Secretary.

Springfield, represented by John Costigan, Pres., Derick Hartshorn, Secretary.

Waterbury, represented by Louis Lougee, Pres., Ellsworth Candee, Secretary.

Boston and Providence will hold a joint meeting in Boston on March 4.

By the way there will be one session at the Convention to which the ladies will be invited. This meeting will be a most unusual and instructive one.

Keep these dates in mind—Chicago Branch Educational Session and Banquet, **Jan. 28;** Baltimore-Washington Branch Annual Meeting, **Sat. Feb. 4;** New York-Newark, **Feb. 18;** Boston, **March 4.**

Congratulations Walter Meyer! The January issue of *Metal Industry* is exceptionally good.

Business and Social News

BRANCH NEWS

Educational Activities

AMERICAN ELECTROPLATERS' SOCIETY

BOSTON BRANCH

Boston Branch met Thursday the 5th at the Bradford Hotel, Boston, with Pres. DeLorme in the chair.

Minutes of the previous meeting read and approved.

Communications read and placed on file, bills read and moved they be paid.

A report was made on the banquet by the chairman Bill Treadwell who says things are coming along very well and asks that the members get behind it and make it the best yet. Tickets may be had from the committee or the Secretary. Get them now!

The Branch had our old pal Frank Clark as a guest and he made a few suggestions for the banquet committee to follow. Always something doing when Frank hits town. Come again, Frank.

Boston Branch will send one of its members to the New York-Newark Banquet, Feb. 18th. Mr. Stanley Knight will bring back a report of what will take place there.

The chair was then turned over to the Librarian, Arthur Mintie, who had as the speaker Mr. I. V. Wilson of Monsanto Chemical Co., His talk was "Protective Lacquer Coatings".

This was one of the best talks the Branch has heard in some time. He explained what lacquers are made of, what solvents are used on different things such as metals and leather and other articles that must be lacquered. He had samples of solvents with him and passed them around for the members to see. He then answered all questions for the members and was given a rising vote of thanks for his interesting talk. Meeting adjourned at 10 p.m.

Tickets for the Banquet may be had from the Secretary, A. W. Garrett, 100 King St., Dorchester, Mass. $2.50 each. Get them now!

A. W. GARRETT, *Sec.*

PROVIDENCE-ATTLEBORO BRANCH

Prov.-Attleboro Branch held its regular meeting at the Narragansett Hotel, Monday, December 19, 1938. Due to the fact that there was no speaker announced, the attendance was not so large.

Donald Wood, the Librarian, was disappointed in securing a speaker. Mr. Law, however had a friend with him, and he read a paper on the several cycles of cleaning. This paper was very interesting though brief; but we were unable to get him to submit it for the REVIEW.

After the reading, a discussion was started, mainly among Charles Chace, Donald Wood, Robert Maclachlan, Will Cahill, John McLean, about their experience with cleaners and addition agents to plating solutions, that lasted up to 12 o'clock.

J. ANDREWS, *Sec.*

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ANDERSON BRANCH

The Anderson Branch of the A.E.S. held a dinner meeting Monday evening, December 12, at 6:30 p.m., at the Y.M.C.A. President L. R. Hinsch presided.

Mr. George B. Hogaboom was the speaker for the evening. He described the method by which he expected his short researches to work. His ideas on this subject seem to be very practical for the dissemination of knowledge. He then took up the main subject of the evening, which was under the head of "What Do We Know?" He described the recent developments in plating solutions and compared them with the relative advances in plating equipment. His talk was very comprehensive and enjoyed by all present. The meeting adjourned at 9:40 p.m.

E. L. McKINNEY, *Sec.-Treas.*

NEWARK BRANCH

The regular meeting of the Newark Branch, A.E.S., was held on Friday evening, December 16, 1938, at the Club Room of the Hotel Douglas, Newark, N. J. The meeting was called to order at 8:30 p.m., with President John Kotches presiding. All other officers were present with the exception of Stephen Leshnick, Sarg.-at-arms.

The minutes of the previous meeting were read and approved.

The committee of New York Branch for the joint banquet was present at this meeting and reported that they held a committee meeting with the members of the Newark committee, prior to this meeting, at which some of the last details were straightened out. The committee urged the members to boost this affair as much as possible in order to assure an attendance of about 500 which is necessary to make the banquet a success.

Mr. Horace Smith reported progress on the Convention and stated that he was well satisfied with the work the committees are doing, especially the Ladies' Committee, who are trying to outdo the men.

Mr. John Sterling, Past President of the Society, congratulated our Branch on the progress which we have made and extended his best wishes for a very successful convention.

Mr. Paul Oldam, our Librarian, presented as our guest speaker, the second Vice-President of our Society, Mr. Frederick Fulforth of Proctor and Schwartz, Inc. His subject was "Constructive Pre-Plating Methods" and was accompanied by slides and numerous samples. Mr. Fulforth explained that inferior plating is very often not the results of improper cleaning or unbalanced solution but the cause of inferior base metals or inferior grinding and polishing prior to plating. On some of the samples he showed how the crystal structure of the base metal is very noticeable on an article that has been polished, nickel plated and chromium plated. Unless the structure of the base metal is of a fine crystal, the grinding and polishing operations will not eliminate the coarse appearance of the surface. Among his samples was a piece of what he called a poor grade of 3/8″ steel rod bent at right angles. The crystals appeared like a lot of crossed fingers, on the outside bend. He stated that material such as that would prove unsatisfactory for plating.

Mr. Fulforth was given a rising vote of thanks for his very instructive talk. 47 members and visitors attended this meeting which adjourned at 11:00 p.m.

GEORGE WAGNER, *Sec.*

NEW YORK BRANCH

The New York Branch held but one meeting during December, the second meeting being cancelled because of the Christmas holidays.

On Friday, December 9th, a business meeting was held with reports of committees relative to the coming joint Educational Session and Banquet of the New York and Newark Branches, being made. This was followed by a round-table discussion by the membership presided over by Dr. C. B. F. Young, the Librarian of the Branch, on the treatment of steel and iron prior to electro bronze and brass plating. This discussion brought out many interesting remarks relative to procedure of same and was carried on for an hour and a quarter. Being the last meeting of the year, the Branch voted to make it a festive occasion and refreshments were served all around and some good fellowship was indulged in with songs and stories in keeping with the holiday spirit.

There were two applications for membership at this meeting.

F. J. MACSTOKER, *Sec.*

BINGHAMTON-SYRACUSE BRANCH

The regular meeting of the Binghamton-Syracuse Branch was held Dec. 2, at the Cortland Hotel, Cortland, N. Y. This was a business meeting with considerable discussion being held on ways and means of increasing our Branch membership. It was felt that under our new Constitution there are a lot of the younger men actually working at plating who are eligible for membership and we intend to go after some of these young fellows. As an added incentive, an initiation fee by installments was suggested to be put into effect for a determined period.

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The question of a Branch Paper for the International Convention at Asbury Park was debated at considerable length. It was decided to try and agree on a subject by the January meeting. Mr. Geo. Hogaboom's letter suggesting short researches by Branch members was read. We have two members who are familiar with the Sodium Nitrate Ni Strip he suggests for research. However, as neither one was present, we put it over until our next meeting, Jan. 6. Some of our fellows who seemed to think there is a lot more Ni to Strip than there used to be asked why. "Bright Nickel" was the answer. Well, maybe so. The matter of exhibits for the Convention was taken up and it is hoped this branch will be able to offer something in this respect. The meeting was adjourned at 11 p.m.

GEO. SIMMONS, *Sec.*

NEWARK BRANCH

The regular meeting of the Newark Branch A.E.S. was held on Friday evening, December 2, 1938, at the Club Room of the Hotel Douglas, Newark, N. J. Due to the fact that our President had a heavy cold the meeting was called to order at 8:30 p.m. by Vice-President Jack Shamis. Other officers present were: George Wagner, Sec'y.; Nelson Sievering, Treasurer; Paul Oldam, Librarian; Stephen Leshnick, Sarg.-at-arms; and William Harrison, Trustee.

The minutes of the previous meeting were read and approved.

An application for Mr. Lewis Francis Wheeler to Active membership was voted to take the regular course.

The following candidates were elected: to Active Membership, (1) William Bruhns, (2) Clifford A. Marshall, (3) Christian P. Kuell; To Associate Membership, (1) George F. Geiger, (2) Alexander Chowski, (3) George C. Arnold.

Mr. Horace Smith reported that the members who attended the Philadelphia Banquet had a wonderful time both on the bus trip and at the banquet. About 40 persons from Newark Branch attended the Philadelphia Educational Session and Banquet. 20 of this number travelled on a chartered bus which had a capacity seating for 40 people which left plenty of room on the trip for the entertainment which was furnished by some of our local talent.

Mr. Wagner reported that the Banquet Committee for the New York-Newark joint banquet held a meeting on Nov. 30th at the Hotel Pennsylvania in New York. At this meeting it was decided that the price per ticket will be $4.00 which will cover the tax, tip to the waiters and door prizes, of which there will be 50 or more. The Educational Session of this affair will be arranged by Dr. C. B. Young of New York Branch and Mr. Paul A. Oldam of Newark Branch. The committee is trying to make this affair a good old fashioned gathering.

The meeting was then turned over to our Librarian, Mr. Paul Oldam, who introduced our guest speaker for the evening, Dr. Louis Weisberg of Louis Weisberg, Inc., New York. His subject was entitled "Methods of Purifying Nickel Plating Solutions". He stated that his talk on purification methods was for bright nickel solutions but that they could be easily adapted for use in purifying any cold nickel solution. There are two types of impurities which must be removed (a) organics (b) metals. The most common organic impurities are rosin sizing and oil. The main metallic impurities are lead, copper, iron, zinc and chromium. It is possible to remove all of these impurities by electrolysis with either high or low current densities, the pH of the solution brought down to 2, although the most recent method is Filtration.

Dr. Weisberg was given a rising vote of thanks for his talk, a summary of which will be forwarded to the MONTHLY REVIEW for publication.

GEORGE WAGNER, *Sec.*

CHICAGO BRANCH

The regular monthly meeting of the Chicago Branch was held Dec. 10, 1938, at the Atlantic Hotel.

President J. W. Hanlon presided and all other officers were present.

Applications of Mr. G. A. Spencer, Mr. C. A. Peterson, Mr. G. E. Huenerauth, Mr. H. J. Jakobi, and Mr. P. S. Springer, were voted on and all were elected to membership.

Mr. H. A. Gilbertson reported that

everything is ready for the annual educational session and banquet to be held on Jan. 28, 1939, and it is going to be the best affair that Chicago Branch has ever had.

Mr. O. Weickman gave an outline of a very fine educational session to be held in the afternoon.

Mr. Dammers, Treasurer of the G. S. Blakeslee & Co., gave a wonderful talk on solvent degreasing, going into every phase of the subject and illustrating with two reels of motion pictures. The talk was very complete and interesting, and was followed by a lengthy discussion.

The following question was in the question box:

O. *What is the best procedure to nickel plate tin plate so that the adhesion is good enough to withstand forming? What kind of cleaner is best? Should the tin plate be given a copper flash?*

A. A mild cleaner should be used and a 50% sulphuric acid dip before plating.

M. H. LONGFIELD, *Sec.-Treas.*

DAYTON BRANCH

December Meeting

The members of the Dayton Branch met at the Engineers' Club on Friday, December 2nd.

In the absence of the Secretary the minutes were read by Mr. Durnbaugh.

Mr. Conley told the members that Mr. Hogaboom might be able to speak before the Dayton Branch on Tuesday, Dec. 13th. It was decided that if arrangements could be made we would hear Mr. Hogaboom on this date.

Mr. Conley again brought up the subject of a paper for the 1939 Convention, and also asked the members to give some thought to material for a Branch Exhibit. If we are to retain the Trophy that Mr. Leon Haas and the other members who took part in last year's exhibit brought to Dayton, the present time is not a bit too soon to start work on an Exhibit that will even better than last year's.

Our speaker for this meeting was Mr. W. M. Phillips, Chief Engineer of Finishes for General Motors Corp. and President of our National Society.

Mr. Phillips presented a film which

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MAGNUS CLEANERS

he has recently completed telling the complete story in pictures of "The Plating of a Grille".

At the close of the question period following the picture, Mr. Phillips spoke to the members, not as a lecturer but as our National President, after which he was given a rising vote of thanks.

High Speed Copper Plating was announced as the subject of the talk to be given at our January meeting.

CORLISS W. POWELL, *Sec.*

Special Meeting

If at first you don't succeed try, try again. It was a great disappointment to learn that due to circumstances beyond his control Mr. Geo. Hogaboom would not be able to speak at our November meeting. Since no year would be complete without a talk by Mr. Hogaboom it was a distinct pleasure to the members of the Dayton Branch to be able to attend this special meeting to hear his discussion "What Do We Know?"

Mr. Hogaboom is Chairman of the Research Committee and began by telling us what the Committee has been doing, and the results of some of the exposure tests that they are running in various parts of the country. He also told what may be expected in the coming year in the way of Plating Research.

During the course of his talk Mr. Hogaboom told of the advance of Plating in the last few years and the remarkable things that are being done in different parts of the country, telling of Copper and Zinc being deposited commercially at rates that several years ago would have been termed impossible.

In answer to his question "What Do We Know?" Mr. Hogaboom showed that many of the things that we accept as fact are really in need of much more work before they can be considered foolproof.

At the close of the question period following his talk Mr. Hogaboom spoke of the coming Convention to be held in Asbury Park, N. J., and urged the members to arrange to attend.

That Mr. Hogaboom's discussion was enjoyed by the members was evidenced by the enthusiastic vote of thanks at its close.

CORLISS W. POWELL, *Sec.*

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LOS ANGELES BRANCH

The Los Angeles Branch of the American Electroplaters' Society held its regular monthly meeting on Wednesday, November 14, 1938, at the Rosslyn Hotel in downtown Los Angeles.

The meeting was called to order by President Earl Coffin. Minutes and financial reports of the previous meeting were read and accepted.

Mr. P. R. Pine, research engineer of the Harshaw Chemical Co. was the guest speaker of the evening, members literally bombarded him with questions and in all cases received satisfactory answers.

Mr. D. N. Elched of the DuPont Co., passed around samples of copper plated work which had been plated in the new DuPont bright copper solution. Considerable interest was shown in these samples, but as it was getting late, Mr. Elched decided to present the facts at the next meeting.

The following questions were found in the question box:—

Q. How much time is required to deposit .001 of copper and will it be bright?

A. Bright deposits of .001 of copper can be obtained from the new DuPont bright copper, from 10 to 20 minutes depending on the current densities employed.

Q. I would like to know what causes spots on brass valves that have been nickeled color buffed then chrome plated, the work coming spotted from the chrome tank.

A. These spots would be due either to high temperature or to low sulphate content.

Q. What causes white spots on brass work coming from a vapor degreaser?

A. Corrosion—clean out degreaser thoroughly and start in with fresh solvent.

Meeting adjourned at eleven p.m.

RAYMOND SOLIVAN, *Sec.-Treas.*

TORONTO BRANCH

The Executive Board is working hard to make the opening meeting a bumper one when every member is expected to attend, and by the way, you old timers, just because you have been in the Toronto Branch for twenty years or so does not give you the privilege to stay away. You are needed now more than ever. We have much to learn yet, and the end is not nearly in sight. That is one grand and glorious feeling which differs from other organizations. We all know a lot, other platers know more, but no one man knows it all. Read Dr. Blum's paper in November REVIEW. Let us sit side by side with the electro-chemist at our meetings and both will find something out. You can't do this by staying away from the meetings.

The next Convention will be here before we are ready for it, so let us start now. You Toronto members from Dartmouth, Nova Scotia, and east and west of Ontario, send in your plating problems. Your secretary is willing and will always answer your letters. For instance you could write a paper on "Methods of Procedure" which will be read at Toronto Branch meeting, and then turned over to the editor of the REVIEW where our paper will be taken care of.

So in anticipation, may this be a fitting time to ask your kindly acceptance of the Toronto members' salutations in wishing you all a Happy and a Prosperous New Year.

JAMES S. CAIRNS, *Rec. Cor.*

MILWAUKEE BRANCH

The 294th regular meeting of the Milwaukee Branch, A.E.S. was held in the Colonial Room of the Republican House, on Thursday, January 5, 1939.

The meeting was called to order by the Vice-President Rodney Olsen at 8 p.m.

Roll call of officers found all present with the exception of President Dexter Rhodes. Minutes of the previous meeting were approved as read and all communications were placed on file.

Mr. Henry Bornitzke, who was

appointed as Chairman of the Ware Exhibits for the Milwaukee Branch, urged all members to get busy now on their exhibits for the coming International Convention, and to report to him, at their earliest convenience, as to what they were going to display.

The motion was made and seconded that the Milwaukee Branch hold a Banquet this year instead of their annual Smoker. This idea was approved and the date set is Saturday, April 22nd. The chair appointed Jack Geissman, Chairman; Dan Wittig, Publicity; Henry Bornitzke, Educational; and Bob Steuernagel, Sr.

Harry Unke suggested that the Milwaukee Branch organize a bowling team and challenge all near-by Branches to match games. This idea was met with great approval and so it was decided, that since this idea was Harry's, he should be Captain and organize the team. It was also up to him to arrange for the games.

The meeting was then turned over to the Librarian who reports that at the February meeting we are going to have Mr. H. I. Hansen, E. I. DuPont De Nemours & Co., of Chicago. His subject will be: "High Speed Bright Copper".

The Question Box

Q. Are there any immersion heaters that can be used to heat a chrome solution?

A. The local Gas and Electric Co. have perfected a heater suitable for a number of solutions.

Q. Can Dye Casting be barrel plated?

A. Yes. Cu plate not less than .005. Transfer to Ni. Barrel plate .003.

Q. How can small check marks be prevented on Cr plated steel stamping particularly in a cold chrome solution temp. 112F., 150 amp./sq. ft?

A. None.

Q. What kind of a pickle can be used to remove fine scale from the inside of nickel tube and leave a white clean finish?

A. Ferric Chloride, Nitric Acid and water were suggested. Use cold. Proportions were not stated.

Q. What is a strip for Ni on steel?

A. 5 ozs./gal. Sodium Nitrate. Reverse current. P.H. 7-8. Use warm. Use steel hooks for stripping.

Q. What is the cause of a white haze or film on chrome plate?

A. Oxide from buffing is the cause. Run thru cleaner and acid dip before plating.

Meeting adjourned at 9:45 p.m.

ROBERT B. GOODSELL *Sec.-Treas.*

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DAYTON BRANCH

January Meeting

The first meeting of the new year was held at the Dayton Engineers' Club on Friday, January the 6th.

The meeting was called to order by Mr. Conley and the minutes of our last regular meeting were read and approved.

After a short business session the meeting was turned over to Mr. Luechauer, our Librarian, who introduced the speaker for the evening, Mr. F. F. Oplinger of the E. I. DuPont DeNemours & Co. Mr. Oplinger gave a most interesting talk on the development and use of "High Speed Copper Plating".

Beginning with the first work done on this subject he told of all the problems that came up during the search for a method of plating copper at a high rate of speed. After a long period of research some very good results were obtained in the laboratory and a commercial set up was installed and put into use. After about two days use pitting developed. According to Mr. Oplinger this was pitting at its worst. Some time later an addition agent was found that eliminated this and today, using the solution resulting from these experiments and a moving cathode copper is being deposited at rates that a few years ago were unheard of.

During the discussion which followed this talk the fact was brought out by Mr. Oplinger that there is a film formed on this copper that must be removed before it can be nickel plated, this usually being done by dipping in a cyanide solution.

At the end of this period Mr. Oplinger was given a rising vote of thanks for his fine talk on this subject, which is becoming more important in the plating industry all the time.

At this time our meeting was adjourned until February when we will hear Mr. Hull of the DuPont Co., his subject to be announced.

CORLISS W. POWELL, *Sec.*

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DETROIT BRANCH

Jan. 6, 1939. Meeting called to order by the President, J. W. Higgins at 8:30 o'clock. There being a good number in attendance. Approximately fifty people.

The reading of the minutes of the previous meeting were dispensed with because they had been published in the December issue of the REVIEW.

There were fourteen members elected to membership and three transfers received.

There were five new applications received which were referred to the Board of Managers.

A letter from Mr. Oldham, Chairman of the Convention Committee for Plated Ware Exhibits requesting that

we appoint a chairman of a committee for Detroit Branch Plated Ware Exhibits for the Convention at Asbury Park. Mr. Higgins appointed C. L. Southwick of the J. B. Ford Company. Detroit should have a first class Plated Ware Exhibit at the Convention and if it is at all possible, Mr. Southwick will see that we have.

A letter from H. M. Cherry, Chairman of the Second Annual Educational Session, Dinner and Dance, stating that on account of his being out of the city it would be impossible for him to attend the meeting, but he wished to convey his appreciation for the work of Chas. Eldridge in charge of the Educational Program and Geo. L. Nankervis in charge of Entertainment and also wished to thank the rest of the committee for their co-operation in helping to make the Second Annual Event a success.

Chas. Beaubien gave a brief report stating that the event was a wonderful success and that all bills were paid and that returns on tickets and advertising were practically all paid up; therefore it was also a financial success.

Mr. W. J. Higgins, our President, also expressed his appreciation of the work of the committee and stated that they had every reason to be proud of the success achieved.

There being no other business to come before the meeting our President introduced Mr. L. L. Stoffel, treasurer of the Ohio Carbon Co., of Cleveland, Ohio, who presented a paper, subject of which was: "Plating Generators—Troubles and Cures". His paper was very well presented and from the number of questions asked and the discussion following indications were that it was quite interesting.

Mr. Herbert H. Cross of Detroit Branch, Supt. of the Kelsey-Hayes Wheel Corp., Plating Dept., was then introduced by the President. Mr. Cross's subject was "Production Zinc Plating". He showed some models of the real cleaning, pickling, and plating tanks that are used in production work on wheel rings. It was quite interesting and instructive and by the number of questions he was asked and the discussion which followed it was very evident that it was also quite interesting. Both of these papers will be published in the next issue of the REVIEW. Our Chairman thanked both of these gentlemen for their efforts in presenting these papers.

The next thing on the program was

the Question Box which our Librarian, Mr. B. F. Lewis took charge of. There were quite a number of questions. These questions and answers will be published in the next issue of the REVIEW.

The meeting adjourned at 10:00 p.m.

T. C. EICHSTAEDT, *Sec.-Treas.*

TOLEDO BRANCH

A regular meeting of the Toledo Branch of the A.E.S. was held on January 5th, 1939, at the new vocational school with 50 members and visitors present.

The meeting was called to order at 8:15, by the president Stanley Moore. The minutes of the previous meeting were read and approved.

After some discussion to appoint a committee to do some research work in co-operation with the research associate at the bureau of standards, Mr. Cope moved that the secretary write Mr. Hogaboom, chairman of the research committee to offer a subject for investigation, before the committee be appointed, so as to give them some idea of what they will have to do, before they agree to do it, which was seconded and passed. At this time the secretary read the application for admission to the Toledo Branch of the A.E.S., of Mr. Gerald C. Rosing, as an associate member. A motion by Mr. Moore to elect the applicant, and seconded by Mr. Cope was passed. After some discussion on the question of reinstatements of members who have been suspended for non-payment of dues, Mr. Gerity made a motion that such members wishing to be reinstated, should be allowed to do so, provided that they are willing to pay the per capita tax, that the branch paid for them during the time they could not pay their dues, which was seconded and passed.

At this time President Moore introduced Mr. Dammers from the Blakeslie Co., who gave a splendid lecture on degreasing with trichlorethylene, by the vapor, immersion, or spray methods, also by the combination of the above mentioned methods. He also very thoroughly explained the physical and chemical properties of the solvent, as well as the principles of design of degreasing machines. Many advantages of degreasing were brought out during his talk. Mr. Dammers very obligingly answered many questions pertaining to the subject at the end of his lecture. Altho some very difficult questions were brought up before him, he very capably answered all of them to the satisfaction of all concerned. Pictures were then shown on the screen, which emphasized the points talked on by Mr. Dammers.

The meeting adjourned at 10:45 p.m.

GASTON BERGEMAN, *Sec.*

International Fellowship Club

Responding to the request of the Chairman of the International Fellowship Club I appreciate the opportunity to convey a message to the membership, and, in this connection, may I stress the fact that I have never lost my interest in the work of, as well as the purpose of our organization. On the contrary I have constantly followed all of its activities as reported in the *Metal Industry*, and I am exceedingly pleased with the idea of a page in the MONTHLY REVIEW of the A.E.S. and express the hope that following the articles by past chairmen of the Club, that this page will be continued with items of interest, or suggestions of betterment, and news in general, excerpts for which can be contributed by members everywhere, as is now being done by members of the A.E.S. for the REVIEW.

ERNEST LAMOUREUX

I might reminisce a lot over good-fellowship in retrospect with my association with the membership of the International Good-fellowship Club in days gone by. However, my sentiments may best be expressed in the following:

It is with pleasure that I review the work any man is doing.
If you like him or love him, tell him now.
Don't withhold your approbation till the parson makes oration.
And he lies with snowy lilies o'er his brow.
For no matter how you shout it, he won't really care about it.
If you think some praise is due him, now's the time to slip it to him.
More than fame or money is good-fellowship kind and sunny, from a good fellow or a friend.
For it gives life a savor of all that's best and braver.
If he earns your praise—bestow it, if you like him, let him know it.
Don't wait till life is over and he's underneath the clover.
For he cannot read his tombstone when he's dead.

In relation to the above, as well as in line with good-fellowship, the salesmen here have the proper spirit and enthusiasm in the work of the local Branch A.E.S. activities, but up to the present at least there has been no incentive for membership in the ranks of the International Fellowship Club, for two reasons. First there is only one event each year, that of the local Branch, which ends their activities for one year, and second, since groups of salesmen cannot organize separately they do not have the advantage of personal contact which you fellows in the East have through your gatherings at the various meetings of the A.E.S. Branches throughout your different sections; and for the same reasons they cannot stage any big event such as your parties in connection with the A.E.S. Annual Conventions, and such an event would furnish an added incentive for added co-operation among all the interested elements connected with the industry out here.

This situation is presented as food for thought merely as such, and, I may add, from an interested angle, but in no sense of agitation for any changes, unless such changes should come voluntarily from the membership of the International Fellowship Club itself, however, I felt that the Club as a whole would be interested in learning something concerning the local picture, whether or not it may wish to do anything about it, is their problem.

The Los Angeles Branch of the A.E.S. will hold their next Annual Educational Session and Dinner Dance at the Roosevelt Hotel in Hollywood on Saturday, March 25th, 1939, and I dare any of you who are inclined to glamour and adventure to come here for this meeting. After all Los Angeles is only a week-end trip from anywhere East by airplane. If I receive enough acceptances I shall have a table reserved exclusively for members of the International Fellowship Club.

ERNEST LAMOUREUX,
2nd. Chairman of the International Fellowship Club.

207 South Reno Street,
Los Angeles, California.

Here and There

It Can Happen In Your Branch, But Don't Let It.

We met a man on the train recently, a strong supporter of the A.E.S. for many years. This man has had a severe illness, was in the hospital, and then for several weeks was confined to his home. In the course of conversation, he told us that during his illness no member of his own Branch paid him a visit, while members of other Branches called on him and sent flowers when he was in the hospital.

What happened to the visiting committee of his Branch that they fell down on the job? Can it be that we are all so pre-occupied with our own affairs that we have not time to think of the misfortune of others? The A.E.S. must never forget its social and fraternal obligations especially to those who are sick and in distress. We hope the case mentioned is an unusual one. It behooves us to be on our guard against similar occurrences.

At the Bridgeport meeting on Thursday, January 12, Mr. C. C. Helmle, General Electric Co., teacher of the Chemistry class, stated that 80% of those enrolled attended the class and 60% of these had perfect attendance.

Mr. Fred Fulforth, Chairman of the Educational Committee should have a most interesting talk at the joint meeting of the Newark and New York Branches, Saturday, February 18, 1939. The speaker is collecting all the information possible from the branches regarding the means used in distributing educational information at these various meetings. Some branches use the round table discussion method. Others use speakers on various subjects followed by questions and answers. Some hold chemistry classes, others don't. There should be a lively discussion on methods at the close of Mr. Fulforth's address, particularly relating to ways and means of making our meetings interesting and instructive enough so that more of our members may be induced to attend.

Mr. Walter Fraine has written us recently from Daytona Beach, Florida, where with Mrs. Fraine, he is spending the winter.

Enclosed in his letter was a check for $121.03 as a 5% dividend from the closed Union Trust Co. of Dayton, Ohio. This brings the return from that bank up to 95% of the total amount to our credit in that bank.

Mr. Fraine wishes to be remembered to all his friends in the A.E.S. We, in turn, hope that Mr. and Mrs. Fraine will enjoy their stay in the Southland and return to their home greatly improved in health.

Here's Something Interesting

The Newark Branch Ladies intend to form a Ladies' Auxiliary of the A.E.S., after the Newark Convention. Every Branch should do likewise. Get the women interested and watch the increased activities at the meetings.

A. E. S. Buttons

A small supply of buttons to be worn on the coat lapel will be on hand at the Executive Secretary's office 90 Maynard Street, Springfield, Mass. after January 1st, 1939.
The price of these buttons is 40 cents each. They are 9/16" in diameter. Colors, Blue outside. White in center.

CHICAGO BRANCH

27th Annual Banquet and Educational Session

To be held Saturday, January 28, 1939

at The Palmer House. The Educational Session will be held from 2 to 4.30 P. M. The Banquet will be held in the GRAND BALL ROOM at 7 P. M. sharp. Tickets are $3.00 each and can be secured now from the Secretary,
M. H. Longfield, 1158 S. Mason Ave.,
Chicago, Ill.

Speakers at Chicago Branch Annual Meeting

W. M. PHILLIPS, President of the A. E. S.
FLOYD OPLINGER, E. I. du Pont de Nemours Co.
G. A. STOCKER, Seymour Mfg. Co.
WALTER PINNER, General Spring Bumper Corp.

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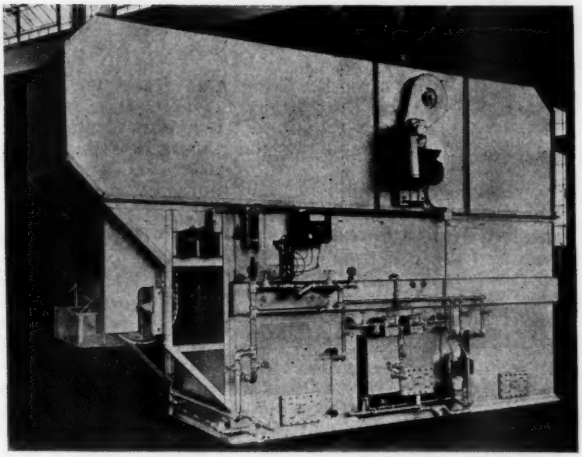

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Branch Offices in Principal Cities

CONVENTION RATES

Following are the Convention Rates for rooms for both the "Berkeley Cartaret" and the "Monterey" hotels:

European Plan "Berkeley Cartaret"	*Rates per day*
Rooms with double bed and running water	$2.50 Single $4.00 Double
Rooms with double bed and shower	$3.00 Single $5.00 Double
Rooms with twin bed and bath both tub and shower	$4.00 Single $6.00 Double
Rooms with twin beds and bath, both tub and shower, *Ocean-front*	$5.00 Single $7.00 Double
Parlors	$5.00 Daily

"New Monterey"

Single rooms with bath	$3.50 per person
Double rooms with bath and twin beds	$3.00 per person
Rooms with running water: single	$2.50 per person
Rooms with running water: double	$4.00 per person

A. E. S. MEMBERS MAY HAVE THEIR SOLUTIONS ANALYZED FREE OF CHARGE

Beginning February 1st, THE MONTHLY REVIEW will offer to its members a new service which, it is hoped, will assist the plater to overcome difficulties which crop up from time to time, either in his solutions, or in the preparation of the work before it is plated. The only requirement for this service is a membership in the A.E.S.

The department is equipped both practically and technically to analyze the sample submitted, and offer recommendations or changes to produce the desired result.

All problems and answers will be published in this column. The name of the person submitting the inquiry will not be printed. He will be informed of the adjustments required, or procedure changes necessary within a few days after the query has been received.

Send a 2 or 3 oz. sample of plating solution and a sample of the defective work if possible to Mr. W. J. R. Kennedy, Editor, 90 Maynard St., Springfield, Mass. In addition, the following information is necessary in order that a complete and accurate diagnosis may be made: Name, address, company, volume of tank, anode area, cathode area, current density, kind of anodes, cleaning procedure, type of anode, and original formula, etc.

NEW SPRAY-BOOTH COMPOUND REDUCES FIRE HAZARD

A new spray-booth compound, which facilitates cleaning of spray-booths and, therefore, helps to reduce both the fire hazard and the marring of finished work by dirt spots, has been developed by Maas & Waldstein Company, makers of industrial finishes, Newark, New Jersey.

To comply with the regulations of the National Board of Fire Underwriters and to maintain high standards of safety, workmanship, and housekeeping, the flammable and unsightly residues that collect in a spray booth must be frequently cleaned out.

The new M & W spray-booth compound makes the cleaning of a spray booth a simple matter. All exposed surfaces of the booth are covered with the compound, which is a non-hardening, but non-oily, paste, applied with a brush. The residues from the sprayed lacquer, paint, or enamel are deposited on the compound; and, when it is desired to clean the booth, the compound and the residues are easily and completely removed with a putty knife, without using a flammable solvent.

6 NEW DU PONT DEVELOPMENTS
and Plating Research STILL *Continues*

CONSTANT research at the du Pont electroplating laboratories has brought new and better chemicals, improved processes and methods of application, wider fields of use. These new developments have opened up entirely new sales opportunities for the electroplater and the manufacturer of metal articles. The experience of many years in making chemicals has naturally assisted in the development and creation of standard and special chemicals and processes for their efficent and economical use, e.g.:

1. High Speed Copper

The advanced cyanide process for production of heavy, adherent coatings of bright copper, in 1/4 the usual time. Soft, fine-grained deposits which can be easily buffed—excellent surfaces for bright or dull nickel plating. Highly efficient, easily installed and controlled in usual cyanide plating equipment.

2. "Cadalyte"* 38

A new and improved cadmium salt for economical production of protective and ornamental finishes on iron and steel. Contains all the active ingredients for producing bright deposits without bright dipping.

3. "Cadalyte"* Maintenance Compound

In maintenance, as a substitute for sodium cyanide, this new product is designed to keep cadmium plating baths operating at maximum brightness and efficiency. Cuts down analyses. Simplifies control and operation. Introduces the correct amounts of sodium cyanide, organic and inorganic brightener, automatically and periodically.

4. "Zin-o-lyte"*

A complete plating salt for brilliant zinc finishes on iron and steel without after-dipping. Simple maintenance. Particularly useful in barrel plating.

5. Du Pont Bright Zinc

A most economical process for highly protective and decorative zinc castings on steel and other metals. Solution easily made up from standard chemicals. Excellent throwing power. Wide operation range.

6. Du Pont Carbonate Remover

An economical product for effective removal of excessive carbonate from plating solutions. Saves dumping or replacement of bath. Increases efficiency, reduces maintenance cost.

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MILWAUKEE BRANCH

Mr. Art Koehler, one of the original members of Milwaukee Branch, passed away January 9, 1939. Art had been seriously ill for nearly a year. His passing was no surprise to the local members, but he does leave a gap in the ranks of these grand men who were active and interested enough in their work to organize this branch. Art Koehler was very attentive to meetings and one of the ardent branch members.

We begin to realize that this branch has been organized for a good many years when we venture to suggest that we have a large number of men whose sons followed in this same work.

John Maszewski has his son, John, Jr., with him in their own business, the National Plating Co. John, Jr., is also an active A.E.S. member. Henry Binder, who is foreman at the Burlington Brass Co., had his son made an active member about five years ago. Roman Binder is employed in Elkhart, Ind., foreman in a large shop there.

Two years ago Robert Steuernagel, of Milwaukee fame, had his son Robert, Jr., installed in active membership. Robert, Jr., is foreman of the S. K. Williams Co. of Milwaukee, of which his father is part owner.

Our well known Jack Geissman, Maas & Waldstein representative, got his son. William J. into the Milwaukee Branch two years ago. William J. has been connected with the Briggs & Stratton Corp. ever since his graduation from Marquette University.

Patrick J. Sheehan, for 27 years head of the Cutler-Hammer, Inc., finishing department, until his death two years ago, has two sons as members. Vincent has charge of C-H now, and Edward has just recently left the metal finishing business, to take a medical course.

Ray Goodsell our genial 1st. Vice President has no sons in the Branch. The best he could arrange was a nephew, Robert Goodsell, our Secretary. Robert is foreman of the Moe Bridges Co. plating and finishing department.

From the above list it would seem that "like father, like son" is quite apparent here.

A. J. HERMANSEN.

At our last meeting a committee was appointed to make all necessary arrangements for our annual Educational Session and Banquet, same will be held at the Schroeder Hotel on Saturday, April 22nd. The Educational Meeting will be held at 2 p.m., and the Banquet at 7 p.m. The following committee have been appointed.

Jack Geisman, Chairman, 2943 N. 45th St.; Robert Steuernagel, Sec.-Treas., 1508 W. Concordia Ave.; Henry Bornitzke, Education, 2602 N. 50th St.; Dan Wittig, Publicity, 1221 N. 3rd St. Henry Bornitzke has promised to have a very fine educational program for the afternoon session; particulars will be announced at a later date.

DAN WITTIG.

MEMBERSHIP CAMPAIGN

JANUARY 1, 1939

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Please mention THE MONTHLY REVIEW *when writing*

The Abstract Section

FREDERICK FULFORTH, *Chairman, Program and Educational Committee*

Copper Deposition. Effect of nonelectrolytes on the cathode efficiency of copper deposition. By S. S. JOSHI, D. N. SOLANKI, and T. V. S. RAO. *J. Indian Chem. Soc.*, **15**, 167-75 (1938). A quantitative study made of the deposition of copper from acidified $CuSO_4.5H_2O$ solution in the presence of the nonelectrolytes: ethyl alcohol, methyl alcohol, glycerine, and acetone, showed that the cathode efficiency of copper increased progressively with additions of the nonelectrolyte up to a limiting value, where it remained constant with further additions of glycerine, but was depressed with further additions of methyl alcohol and acetone. The effect of the nonelectrolyte on the limiting value for cathode efficiency is in the descending order glycerine, ethyl alcohol, methyl alcohol, acetone. Acetone is the least effective.

L. H. SEABRIGHT, *Chemical Abstracts* **32**, 7825 (1938).

Studies of some physico-chemical factors in the electrodeposition of silver. By S. S. JOSHI and S. PANDMANABHAN. *J. Indian Chem. Soc.* **15**, 176-90 (1938) *Chemical Abstracts* **32**, 7826 (1938). A study of best conditions for depositing silver from nitrate solutions, and the effect of additions of methyl alcohol, ethyl alcohol, acetone, carbon disulfide, gelatin, and turpentine. Efficiencies, conductivities, and complex compounds were determined.

ERNEST H. LYONS, JR.

Cathode reactions upon electrolysis of solutions of complex salts. By A. GLAZUNOV. *Chem. Listy* **32**, 246-9 (1938); *Chemical Abstracts* **32**, 7826 (1938). From the microscopic structures of electrodeposits from cyanide complexes of silver, iron, and zinc, complicated mechanisms for the reactions leading to metal deposition were proposed. Theoretical.

ERNEST H. LYONS, JR.

Lead and Lead-lined. By E. T. CRAWFORD, Jr., *Chemical & Metallurgical Engineering*, November 1938, page 589. Lead serves as the modern chemical engineer for transferring, storing, and processing corrosive solutions such as dilute sulphuric, sulphurous, phosphoric and hydrofluoric acids. It is available in sheets, foil, castings, or extruded forms. .05 to .08 per cent copper alloyed with lead increases the tensile strength and hardness without reducing corrosion resistance. 4 to 14 per cent antimony lead increases the hardness and toughness but results in a more brittle alloy. 12 per cent antimony lead melts at a lower temperature than pure lead, consequently the strength of the alloy decreases rapidly above 212° F. .06 tellurium considerably increases the strength of lead, but .08 per cent causes separation of lead telluride particles which prove an undesirable condition for corrosion resistance. Methods for bonding, and fabricating lead are also described. D. S. HARTSHORN, Jr.

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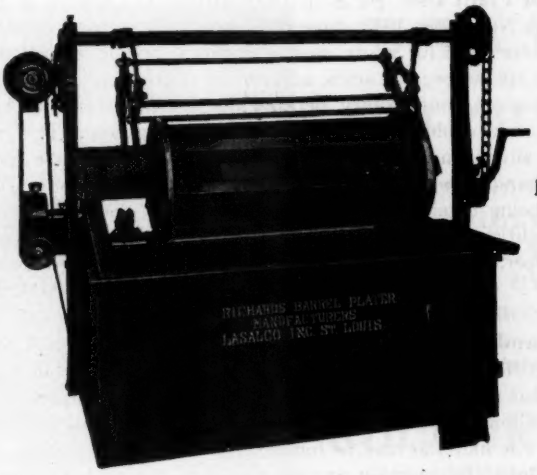

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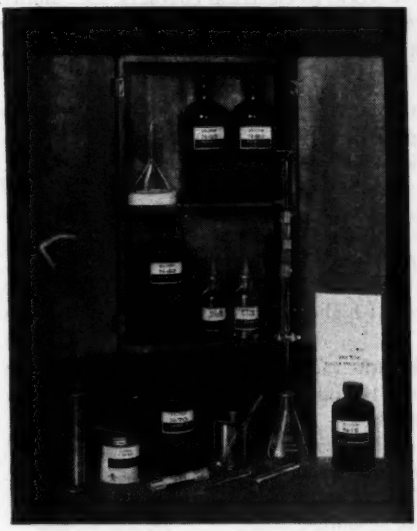
Silver for Plant Use. By A. J. DORNBLATT, *Chemical & Metallurgical Engineering*, November 1938, page 601. The resistant and conductive properties of silver fit it for many uses in chemical and industrial plants. It is resistant to alkalis, organic acids, and certain concentrations of mineral acids. Its high thermal conductivity permits the design of smaller heat-transfer equipment than could be constructed of other material. The corrosion resistance of silver may in many instances be obtained at less cost and with better mechanical properties by resorting to silver coatings on a base metal, the silver being of either the electrolytic or clad metal type, according to specific conditions. "Fine Silver" contains 99.9 per cent silver and the rest usually copper. Silver of still higher purity may be prepared electrolytically.
D. S. HARTSHORN, Jr.

Carbon and Graphite. By F. J. VOSBURGH, *Chemical & Metallurgical Engineering*, November 1938, page 607. The inertness to all but highly oxidizing agents has recently increased the use of carbon and graphite materials for tanks, tank linings, digesters, atmospheric condensers, and electrostatic precipitators. The material may be formed into blocks, tubes, strips, etc., and is easily machined. In constructing tank linings carbon and graphite blocks can be cemented with tar, pitch, special carbonaceous cement, or with the cements offered by many manufacturers. With the exception of many especially prepared impervious carbon and graphite all carbon is porous up to about 25 per cent and under pressure there will be a slight seepage through the material. This factor may be relatively unimportant in some cases. Finely divided carbon is extensively used as an aid to lubrication. Activated or porous carbon has a wide field of application in the filteration of gases, oils, and various liquids generally considered hard to handle in the chemical, pickling, and plating industries. An equally large application should be found in the diffusion of gases into liquids, for the agitation of liquids, and the separation of gases from gases, and gases from liquids.
D. S. HARTSHORN, Jr.

"How to Finish with Flocks". By H. H. MENEFEE, *Industrial Finishing*- Vol. **XV.** No. 1, November 1938, pp. 10-14. Discussion of flock finishes which are cloth materials ground into minute particules of lengths, 1/64 in. to 1/4 in., applied by blowing upon delayed drying sticky binder with a flocking gun. The temperature must be above 60° F. and the air used for spraying both flocks and binder must be perfectly dry. Silk gives a finish with a high sheen and a fair nap. Wool has a good opacity but a short nap. Cotton covers extremely well but has no nap at all. In covering wood it is necessary for the material to be dry and smoothly sanded. White lacquer is used as an undercoat for the binder. The binder suggested was a 50-50 mixture of synthetic silk screen medium and clear synthetic varnish and reduced with slow drying synthetic reducer to spraying consistency. The binder is sprayed first a light coat and then a heavier coat after which the flock is applied.
FRANK K. SAVAGE.

First Aids for Chromium-Plating Baths. By A. DARLAY. *Galvano*, Sept., 1938, p. 20. In considering defects due to the plating bath and not due

NEW! NEW!



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to such factors as surface films on the work, to electrical contacts, etc., simple observation may often suggest the proper remedy. Thus, comparison of color of a sample of the bath with that of a standard sample taken from a new bath after brief working, may indicate a lack or an excess of chromates. If clearer, there is a lack of chromates, and carbonate or sulfate of sodium or chromium should be added. If darker, there may be excess of chromates, and the bath should be operated with an oxidation cell (porous pot) or should be diluted. With lead or lead-antimony anodes, the anode color should be maroon. If some are yellow, these have a poor contact. Yellow chips indicate a bad alloy.

If the bath requires more voltage than usual and there are no bad contacts, the bath contains an excess of chromate or of iron, best remedied by dilution.

A break in the curve for amperes/volts marking the formation of the cathode film should occur at about 2.8 volts. If higher voltage is required, there is a lack of sulfuric acid.

If gas bubbles tend to break around the racks instead of spreading out in a foam, there is too much sulfuric acid. Periodic interruptions of gas evolution is also evidence of excess sulfuric acid.

Examination of the deposit should be equally instructive to an informed observer. Various defects and their probable causes are listed as:

1. Milky deposit—lack of sulfuric acid.
2. Deposit burns easily—excess of sulfuric acid.
3. White spots—lack of sulfuric acid.
4. "Toad-skin" spots—excess chromates.
5. Color is less blue—much iron in bath.
6. Brown spots—lack of sulfuric acid.

In these cases, there may be other causes such as improper current density and temperature or poor contacts. These should be considered and checked if possible before making corrections indicated. C. T. THOMAS.

Electroplating of Tinplate. By A. W. HOTHERSALL and C. J. LEADBEATER. *The Metal Industry*, London, England. Volume **L111**, No. 19. November 4, 1938. Tin as a basis for nickel and chromium possesses this advantage over steel. The surface luster is high and requires little preparation for a good finish. Copper and nickel combined seem to adhere better than nickel direct. The heavier the tin deposit, the better the adhesion. This was found to be on parts that are formed. A porosity test was made between an unplated specimen and one with a thin coating of nickel. The results showed less porosity on plated specimen. Additional test with average thicknesses of Cu. 0.00005, Ni. 0.0002, Cr. 0.0003 showed very small traces of porosity.

Suitable methods that were found to obtain the best results for plated coatings are described.

By using special methods of cleaning, which are also described.

Chrome can be deposited direct on the tinplate. Deposit is usually dull and requires buffing to give a bright finish.

On coke tinplate, the protective value of Chrome of 0.00003 inches is superior to coating of Cu., Ni. and Cr.

The above specimens also were pressed into cup-shapes without flaking or noticeable cracking. ROBERT B. GOODSELL